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The
Theories of Instinct

By E. C. Wilm

The Philosophy of Friedrich Schiller (Messenger Memorial Prize, Cornell University), Boston, 1912.

The Problem of Religion (Bowdoin Prize, Harvard University), Boston, 1912.

The Culture of Religion: Elements of Religious Education, Boston, 1912.

Henri Bergson: A Study in Radical Evolution, New York, 1914.

Religion and the School, New York, 1914.

The Theories of Instinct: A Study in the History of Psychology, New Haven, 1925.

Instinct and Intelligence (in preparation).

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The Theories of Instinct

A Study in
the History of Psychology

By E. C. Wilm

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To
Grace Gridley Wilm

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PREFACE

ONE of the foremost problems of recent years in the field of philosophical biology is the problem of mechanism and vitalism, which is, in turn, merely an aspect of the larger problem of body and mind in general. Mechanism and vitalism represent two divergent views of nature, mechanism conceiving all events, including those commonly called vital, as capable of explanation by the employment of principles familiar to physics and chemistry, thus assimilating the realm of vital phenomena to that of natural happenings in general; vitalism holding, on the other hand, that the processes of life are incapable of explanation by merely mechanical agents, and require the hypothesis of entelechy, mind, or some similar non-mechanical principle. Now it has seemed to me that the class of acts traditionally called instinctive affords a capital opportunity for the study of the general question whether nature as a whole is capable of a mechanistic interpretation; for it is here that "body" and "mind" seem to come into transactive relations with each other, more, for example, than in phenomena like intra-organic adaptation or physiological repair, which, though regulative in character, belong more evidently to the autonomous or non-mental regulatory processes.

Driesch, among recent biologists, has seen the peculiar significance of instinct for the problem of the nature of vital processes. "It is greatly to be regretted," he writes, "that instinct is so very little studied nowadays, at least in an exact way. . . . There can be no doubt

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that some of the most important results of biology in the future will be derived from the study of instinct."¹ Driesch proceeds to mention two problems connected with instinct which seem to him of special importance, first, the question whether instincts can be regulated or not, i.e., the question of modifiability, and, second, the question as to whether the stimuli which call forth instinctive reactions are simple stimuli exclusively, or also complex "individualized" stimuli, such as a visual object as a whole. There seems to me to be some misapprehension regarding both these points; nevertheless, Driesch seems to have clearly grasped the significance of instinct for the entire psycho-physical problem, and it is with the conviction of the relevance of the topic within the general context of the vitalistic controversy that the present study has been undertaken.

The present work is an attempt to trace the principal theories of instinct in their historical connections. The earlier history of the instinct theories is inevitably a mere sketch, since, previous to the eighteenth century, only indications exist of the general type of explanation prevailing within a given system or period, explicit problems, such as the relation of instinct to intelligence, the genesis of instinct, and the like, which are so familiar in modern discussions, not having come to conscious recognition. Indeed, it may fairly be said that, although there are full and valuable descriptions of the life habits of animals in antiquity (as in Aristotle's *History*

¹ *The Problem of Individuality*, pp. 24-25. See also the same author's *History and Theory of Vitalism*: "In addition to the phenomena of coördinated animal movements, those of formation from the germ have always been the starting point of all Vitalism." P. 12.

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of *Animals*, to cite only one notable example), only the slightest beginnings of a scientific theory of instinct can be discovered previous to the rise of modern evolutionary biology.

As a consequence, the earlier part of my discussion necessarily resolves itself largely into an account of the various ways in which the so-called mind-body problem, and the fact of mental control and regulation (where a view of the mind as a determinative agency was entertained) were envisaged. Nor have I confined myself to the discussion of psycho-physical questions in the narrower sense, that is, in the sense of the relation and interaction of bodily and mental processes in the individual organism, since any assertion of influence of non-physical agencies over bodily processes, like the *Nous* of Anaxagoras, the archetypes of Plato, the universal Reason of the Stoics, and the like, or vice versa, of physical forces over non-physical, as in Plato's doctrine of the resistance offered by matter to the action of the Idea, seemed to me in principle as germane to the general psycho-physical problem as the influence of pleasure and pain upon action, or of intelligence upon instinct.²

Some will doubtless feel that, on account of the somewhat vague relevance, this part of my discussion

² If one feels any need of reassurance in undertaking an historical study of the kind here attempted, the following passage from a well-known American biologist, which is only one example of similar generalizations in current biological discussions, will serve the purpose. "Before the renaissance no practical problems in behavior were recognized. All activities in organisms, plants as well as animals, were held to be under the control of souls, agents not amenable to law and not subject to experimental analysis." S. O. Mast, *Science*, Dec. 13, 1918, p. 579.

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has been unduly extended. Still the earlier, especially the Greek, conceptions of animal behavior and mentality seem to me to possess a sufficient interest to repay a brief survey, even if for no other reason than to illustrate how very recent the concept of instinct is, and how it has been gradually disentangled from the older popular and metaphysical conceptions, which survive, along with the more articulate modern formulations, to the present day. I felt this undertaking the more worth while, since there is at the present time no adequate account of the theories of instinct, in their historical development. Ziegler's *Begriff des Instinktes einst und jetzt* (Jena, 1910), although a skilful and competent work, remains, even in its third and enlarged edition, a mere sketch, a remark which applies equally to the historical chapter in Groos' *The Play of Animals*; and the two historical chapters in Drever's *Instinct in Man* (Cambridge, 1917) confine themselves to the modern period, and to human psychology. I have profited not a little from these works, and I hope that the present volume may carry a little further the excellent studies of these men who have preceded me in the field.

The principal periods in the history of the theories of instinct are (1) the ancient (Greek and Roman) period; (2) scholasticism; (3) the period of the Enlightenment, and (4) the modern or scientific period. The two contrasting points of view of recent discussion, the mechanistic and vitalistic, will be seen to be more or less distinctly foreshadowed throughout the entire history of psychology. Although there are obvious ob-

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jections to the terminology, we might call these tendencies the naturalistic, monistic, or materialistic, and the animistic, dualistic, or idealistic, the naturalistic being represented by Heraclitus, the Greek atomists, Leucippus and Democritus, the Epicureans, Plutarch, Porphyry, Montaigne, Gassendi, Condillac, Leroy, Rorarius, Thomasius Jenkin, Leibniz, La Mettrie, Vogt, Büchner, and a host of nineteenth century and present-day writers of the type of Bethe, v. Uexkuell, and Loeb; the animistic or idealistic tradition by such writers as Anaxagoras, Plato, Aristotle, by Stoicism, the scholastic philosophy, mediæval and modern, vitalism and the recent neo-vitalists, Driesch, Lukas, C. C. Schneider, Bergson, McDougall, and others.

The present volume carries the discussion only through Darwin, the developments since Darwin's day being left for another volume soon to be issued, which will not only offer a *résumé* of the principal points in recent discussions, but will make some attempt at constructive interpretation, so that the two small volumes may together give a fairly complete treatment of the subject of instinct, both on the historical and the theoretical sides. Although pretending to be little more than an outline, it is hoped that the work may prove of some use as an introduction to the subject of animal intelligence.

It is a pleasure to express my thanks to Professor William Morton Wheeler for reading a good part of my manuscript, and for offering a number of suggestions, and to Professor J. R. Taylor and Mr. J. C. Palamountain, for advice in several linguistic matters.

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I am grateful, also, to Professor Hans Driesch for free access to the philosophical library of the University of Leipzig, for his interest in the German edition of my work, and for numerous personal kindnesses.

E. C. WILM.

The Theories of Instinct

CHAPTER I

The Pre-Socratic Period

I

THE earliest recorded attempts to explain the world by reference to empirical principles, as opposed to mystical and religious interpretation, were made by a number of philosophers commonly classed together under the head of Ionian hylozoism. Thales (*c.* 640-546 B.C.), the first of these, is named by Aristotle as the founder of Ionian natural philosophy, and hence of philosophy in general. "Of those who first philosophized, the majority assumed only material principles or elements, Thales, the originator of such philosophy, taking water for his principle. He was led to this, probably, by the observation that the nutriment of all things is moist, and that heat itself is generated by moisture, and living things live by it; but that by which anything is generated is its principle; further, by the observation that the seed of all things is naturally moist; but the principle, in virtue of which the moist is moist, is water."¹ Aristotle is authority for the statement, furthermore, that "according to Thales the magnet is animated, because it attracts iron";² and that "Thales believed that all things were filled with gods."³ This statement is not to be inter-

¹ Arist., *Met.*, I, 3.

² Arist., *De An.*, I, 2.

³ Arist., *De An.*, I, 5.

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preted dualistically, however, as is done by Cicero,⁴ as Aristotle expressly contrasts the hylozoism of the early physiologists to the dualism of Anaxagoras.⁵

The doctrines of Anaximander (611-c. 547), the second of the Milesian school, are of special interest, as he is apparently the first to teach distinctly the origin of life from some more primitive principle, and the development of man from aquatic forms. The striking resemblance between the ideas of Anaximander and those of modern materialistic and evolutionary conceptions is unmistakable. The primitive substance, according to Anaximander, was not water, or any other known element, but the infinite or unlimited (*τὸ ἄπειρον*).⁶ The infinite is, moreover, not an immaterial entity, but infinite matter. It is undetermined in quality, and infinite in quantity. From it the elementary contraries, warmth and cold, the moist and the dry, which exist undifferentiated in the original chaos, arise by separation.⁷

The first living creatures were produced in the water. Man's hypothetical ancestors were aquatic animals, encased in horny coverings, which were shed as soon as the necessary organs were developed to enable man to subsist on land. There is no account of the evolution of animals, other than man, from lower forms. As to the origin of life as such, Anaximander appears to have been the first to teach the doctrine of abiogenesis, aquatic forms having originated directly from lifeless

⁴ Thales Milesius aquam dixit initium rerum, deum autem eam mentem, quæ ex aqua cuncta fingeret. De Nat. Deorum, I, 10.

⁵ Arist., Met., XII, 2; Phys., III, 4.

⁶ Arist., Met., XII, 2; Phys., III, 4.

⁷ Schleiermacher, "Ueber Anaximandros," *Werke*, II, 171-296.

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matter.⁸ Anaximander is asserted to have described the soul as an aëriform substance.⁹

Of interest is the interdiction of fish eating, on the ground of the descent of man from fishes, an attitude we shall encounter again in Epicureanism and Neo-Platonism, where the eating of animal flesh is also forbidden on the ground of the close relationship between animals and man.

Anaximander is celebrated by Haeckel as the forerunner of Kant and Laplace in cosmology, and of Lamarck and Darwin in biology. Whether this high estimate is justified or not, we must recognize in him the first philosopher to suggest distinctly a number of leading ideas of modern evolutionary theory, the aquatic origin of life, the derivation of the higher from lower forms, the principle of adaptation, and the struggle for existence, "a literal prophet of some of the eighteenth century, rather than of the nineteenth century, speculations upon evolution."¹⁰

Anaximenes of Miletus (585-528), a disciple of Anaximander, makes air (ἀήρ, πνεῦμα) the *principium* of things, a doctrine later revived by Diogenes of Apollonia, and destined to become an idea of great importance in Stoic psychology and in the history of psychology generally.¹¹ Anaximenes was determined in

⁸ Osborn, *From the Greeks to Darwin*, pp. 33-36.

⁹ Ueberweg, *History of Philosophy*, I, 35; Zeller, *Pre-Socratic Philosophy*, I, 256.

¹⁰ H. F. Osborn, *From the Greeks to Darwin*, pp. 33-34. For a fuller discussion of the relation of Anaximander to the evolution theory see Teichmüller, *Studien zur Geschichte der Begriffe*, pp. 63 ff.

¹¹ The Greek word for soul (ψυχή), from which the modern word psychology is derived, meant originally breath, as does also the Latin

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this; according to Simplicius,¹² by the variable nature of his element, and by the analogy of the world to a living being. "It appeared to him, in agreement with ancient opinion, founded on the evidence of the senses, that in men and animals the expiration and inspiration of the air is the cause of life, and of the cohesion of the body; for when the breathing ceases or is hindered, life becomes extinct, the body decomposes and perishes. It was natural for Anaximenes to suppose that such might also be the case with the world. For the belief that the world was animate was very ancient, and had already been introduced into physics by his predecessors."¹³

From air the other forms of being, fire, water, and earth, are derived by a process of condensation (*πύκνωσις*) and rarefaction (*μάνωσις*). Air is the soul both of the individual and of the universe. "As our soul, which is air, holds us together, so breath and air encompass the universe." The air of Anaximenes, like the primitive substance of his predecessor, Anaximander, is infinite in extent.

The doctrine of Diogenes of Apollonia is of interest in the present connection, as he not only agrees with Anaximenes in the derivation of things from an aëriform principle, but defends the hylozoistic conception against the dualism of Anaxagoras, with whom a

anima (cf. also spirit, from *spirare*, to breathe). For the doctrine of air as mind, as it appears in Greek medicine (Praxagoras), and in the philosophies of Peripateticism, Stoicism, Philo, and in the Cartesian doctrine of animal spirits, see Siebeck, *Geschichte der Psychologie*, I, 2, pp. 130 ff.

¹² *De Cælo; Schol. in Arist.*

¹³ Zeller, *History of Greek Philosophy*, I, 270-271.

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new interpretation of nature may be said to have originated.

Brief mention must be made of the system of Heraclitus (of disputed date, probably about 536-470 B.C.), who seems, on the whole, to belong with the Ionian hylozoists in his general conception of nature, and whose main ideas reappear in the most important school of antiquity, from the point of view of the theory of instinct, Stoicism. Like his predecessors, Heraclitus considers all substances as transformations of one primitive element, which he sometimes calls fire ($\pi\upsilon\rho$), sometimes air or breath ($\psi\upsilon\chi\eta$), and which, like the substances of the earlier hylozoists, is animated, and is the source of animation.¹⁴

Natural processes have a twofold direction, a downward, from fire to water, earth, and death, and an upward, from earth and water to fire and life. All things contain in themselves the germ of their opposites, and are driven from change to change, through the inner tension or opposition they contain. Strife, then, or conflict, so far from being that which annuls and destroys, is the very author of existence and the agent of progress. "Homer was wrong in saying, Would that strife might perish from among gods and man! He did not see that he was praying for the destruction of the universe; for, if his prayer were heard, all things would pass away."¹⁵

¹⁴ One is reminded of the modern theory which considers all organic life as a transformation of solar heat. See Weber, *History of Philosophy*, p. 33, n. 2.

¹⁵ Ritter and Preller, *Historia Phil.*, Her. fr. 27d. Burnet, *Early Greek Philosophy*, frs. 43 and 44.

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Change, however, occurs within definite limits or bounds set by fate or destiny. "In obscure and undeveloped form originated here the conception of natural law. It appeared in the vesture of the mythical *εἰμαρμένη*, an all-determining Fate, or an all-powerful *δίκη*, menacing every deviation with punishment. Since it is to be regarded as the peculiar object of reason, he called it the *λόγος*, the reason that rules the world."¹⁶

In the human organism, the body represents the earthy, the soul the fiery, element. Through the breath it partakes of the warm air, and thus of the rationality possessed by fire. Hence, also, "the dry soul is the wisest and best." The idea of the soul as an aëriform principle, the notion of change as due to an immanent principle of opposition, and the concept of universal law or reason in nature, these leading ideas of the Heraclitean philosophy we shall see incorporated in later systems of diverse tendencies, making Heraclitus a writer difficult to classify.

Ziegler asserts,¹⁷ on the authority of Scheitlin,¹⁸ that Heraclitus regarded the difference between the lower animals and man as merely one of degree, the souls of animals being less fiery than the soul of man, but I have not been able to verify this statement by an examination of the extant fragments.

The resemblance between the leading ideas of Heraclitus and later systems, especially Platonism and Stoicism, is unmistakable, although Heraclitus is perhaps

¹⁶ Windelband, *History of Ancient Philosophy*, p. 54.

¹⁷ *Begriff des Instinktes einst und jetzt* (3 ed.), pp. 3-4.

¹⁸ *Tierseelenkunde*, p. 145.

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nearer to the monistic and naturalistic interpretation of Stoicism than to the extreme dualism of Plato. The entanglement of the soul with the grosser elements of earth and water in man, the relation of the soul to the cosmic reason, the conformity of the reasonable soul to universal law, these ideas are essentially Platonic in character. On the other hand, in the identification of the soul with a material element, and in the emphasis on law and causal connection, and on the immanence of the universal reason, Heraclitus, like Stoicism, doubtless approaches the naturalistic position later expounded in its classical form by atomism.

The truth is that the distinctions coming to full recognition in the later stages of Greek philosophy are merely implicit in Greek hylozoism. The systems of the earliest philosophers are, as Weber aptly says, like rudimentary organisms. "The perfection of a living being depends upon the greater or less differentiation of its organs; the more its constitutive parts differ from each other and become specialized, the higher it rises in the scale of beings. Now the Ionian philosophy is, when compared with Aristotle, perfectly uniform. . . . Progress in science, as well as in nature, is made possible by the division of labor, by differentiation of the constitutive elements of being, by the multiplication and opposition of systems."¹⁹

II

The philosophy of Heraclitus, like that of the earlier Ionian physicists, is monistic in the double sense of trac-

¹⁹ *History of Philosophy*, p. 23.

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ing the whole of existence back to a single primordial principle, and in representing the motive force of becoming as immanent in the process of change, points of view which recur in important post-Aristotelian writers, particularly Strato and Theophrastus, and in Stoicism, as we shall notice later.

The first clear suggestion of a dualistic conception of nature is put forward by Empedocles of Agrigentum in Sicily, of somewhat uncertain date (born *c.* 500 B.C.), who supposed two classes of irreducible principles, four physical, earth, water, air, and fire, and two non-physical principles, attraction and repulsion, personified as love and discord. The latter are represented as motive forces, through which the union and separation of the four material elements are brought about. In this way the empirical world of earth, sky, and ocean, of plant, animal, and man, gradually originated.

Empedocles, like Anaximander, taught the doctrine of abiogenesis, or the spontaneous generation of life out of inorganic substances. Plants spring first from the earth, being succeeded by animal life, which arose only after a long series of trials, during which the various organs, existing at first separately, came together fortuitously, only such combinations as were able to perpetuate themselves surviving, the unfit being eliminated. Empedocles is credited by Osborn with four modern evolutionary ideas, "first, that the development of life was a gradual process; second, that plants were evolved before animals; third, that imperfect forms were gradually replaced (not succeeded) by perfect forms; fourth,

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that the natural cause of the production of perfect forms was the extinction of the imperfect."²⁰

The dualistic conception contained in the distinction between physical and non-physical principles in Empedocles (a suggestion of our modern matter and force), is more explicitly carried out by Anaxagoras of Clazomenæ in Asia Minor (500-450), who, like Empedocles, reduced all generation and decay to the union and separation of primitive and unchangeable elements, which in Anaxagoras, however, were infinite in number.²¹ The motive forces responsible for aggregation and disruption do not belong to matter itself (hylozoism), nor are they impersonal psychical agents, like love and hate (Empedocles), but are ascribed to a world-ordering intelligence (*νοῦς*).

Anaxagoras is thus the true father of dualism, and the forerunner of all vitalistic systems as well. For this he is praised by Aristotle in an oft-quoted passage in the first book of the *Metaphysics*: "After these philosophers and such first principles (fire, water, and earth), since these principles were found inadequate to account for the production of the universe, men were once more compelled, as I have said, by facts themselves to investigate the principle which naturally follows next in order. . . . So when some one said that it is the presence of Mind which is the cause of all order and arrangement in the universe at large, just as it is in the animal organism, he seemed, by contrast with his predecessors, like a sober man compared with idle

²⁰ Osborn, *op. cit.*, p. 41.

²¹ Arist., *De Cælo*, III, 2; Simplicius, *Com. in de Cælo*, 144 b.

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babblers. Now we know for certain that Anaxagoras had conceived this idea, but Hermotimus of Clazomenæ is alleged to have given still earlier expression to it. Those who framed this conception, then, assumed the cause of beauty as a principle in things, and, at the same time, as being a principle of the kind by which motion is communicated to things."²²

But one seems almost to be reading a page from some modern opponent of vitalism when one reads the criticism already passed by Plato and Aristotle upon the uselessness of Anaxagoras' principle as a scientific principle of explanation. Thus Socrates is made to complain that Anaxagoras made no actual use of his Mind and assigned no real causes for the order in things, but alleged as causes airs, ethers, waters, and a host of other monstrosities.²³ And Aristotle says still more strikingly: "Anaxagoras . . . uses his Mind as a mechanical device for the production of order in Nature, and when he is at a loss to say by what cause some result is necessitated, then he drags in Mind as a last resource, but in all other cases he assigns anything and everything rather than Mind as the cause of what occurs."²⁴

The ordering intelligence is represented, in contrast with material existence, as something unmixed, unitary, self-governing, and possessing all knowledge and power. Everything else is mixed with other things, but mind is pure, simple, and subject only to itself. Matter, which is inert and devoid of order, it sets in motion, and

²² Arist., *Met.*, I, 3 (Taylor's translation).

²³ Plato, *Phædo*, 98 b.

²⁴ Arist., *Met.*, I, 4.

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creates out of it an orderly universe. Anaxagoras denies the existence of both fate (εἰμαρμένη) and chance (τύχη).

ON the pre-Socratic period see Ritter and Preller, *Historia Philosophiæ*; Diels, *Fragmente der Vorsokratiker*; Burnet, *Early Greek Philosophy*; Aristotle, *Metaphysics*, I; Zeller, *The Pre-Socratic Schools*; Erdmann, *History of Philosophy*, §§ 18-43; Windelband, *History of Ancient Philosophy*, §§ 14-22; Siebeck, *Geschichte der Psychologie*; Brett, *A History of Psychology*, Vol. I, Pt. I, Chs. II-III; Chaignet, *Histoire de la Psychologie des Grecs*; Heinze, *Die Lehre vom Logos*; Bäumker, *Das Problem der Materie in der griechischen Philosophie*; Byk, *Die vorsokratische Philosophie der Griechen*; Teichmüller, *Studien zur Geschichte der Begriffe*; Gilbert, *Griechische Religionsphilosophie*; Dessoir, *Outlines of a History of Psychology*; Döring, *Geschichte der griechischen Philosophie*; Tannery, *Pour l'histoire de la science hellène*; Klemm, *A History of Psychology*; Bauch, *Das Substanzproblem in der griechischen Philosophie*; Windelband, *Geschichte der Philosophie*, 10 ed., pp. 20-54; Ueberweg, *Grundriss der Geschichte der Philosophie*, 11 ed., §§ 10-24; Gomperz, *Griechische Denker*, Erster Bd., Buch I-II; Beare, *Greek Theories of Elementary Cognition*; Wellmann, *Die pneumatische Schule bis auf Archigenes*; Scheitlin, *Tierseelenkunde*, I, Ch. IX; Ziegler, *Der Begriff des Instinktes einst und jetzt*; Rohde, *Psyche*.

CHAPTER II

The Systematic Period

Atomism, Plato and Aristotle. The Peripatetic School: Strato and Theophrastus

IN the writers discussed hitherto the distinction between the bodily and the mental becomes gradually more explicit as we pass from the earliest hylozoistic systems, where the material and the living are indistinguishably merged, to the systems of Empedocles and Anaxagoras, in which physical and non-physical principles begin to be separated as two fundamentally different categories, both, however, being recognized as true explanatory principles. In the system of Leucippus and Democritus philosophy enters upon a critical and controversial phase; the dualism heretofore merely implicit comes to conscious recognition, and is subjected to a methodical criticism. The dualistic interpretation is meanwhile continued and greatly elaborated in the systems of Plato and Aristotle, in whom a world-view wholly different from the materialistic atomism of Democritus, a world-view destined to mould subsequent philosophy in an unprecedented manner, begins to take definite shape.

I

Leucippus, of doubtful date and antecedents, and Democritus of Abdera in Thrace (*c.* 460-370), recognize only two principles of things, the "full" and the "void," being and non-being (*ὄν* and *μὴ ὄν*). The

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“full” consists of an infinite number of indivisible, primitive, uncreated particles of matter, or atoms, which are qualitatively alike, differing from each other only in their form (σχήμα), position (θέσις), and order or arrangement (τάξις),¹ that is, in their quantitative or geometrical aspects. These quantitative differences are sufficient to explain the whole of existence, just as the same letters of the alphabet are employed in a tragedy or a comedy.² The motion of atoms is eternal, but the varying weight of atoms produces different rates of motion, with resulting collisions and lateral and rotary motions, and the consequent formation of composite bodies, and finally of worlds.

Living beings arose from terrestrial slime. Fire and the soul, like other kinds of existence, consist of atoms, the soul atoms, however, being smooth, spherical, and therefore highly mobile. Perception and thought, as well as bodily movements, are the result of the motion of atoms. In vision, for example, the eye is penetrated by emanations from objects (εἶδωλα), with the result that the perceptions are similar to the objects perceived, the emanations being in some sense reproductions or symbols of the objects in the external world.³

The soul atoms are distributed throughout the body, but most numerous in the sense organs, the brain, the seat of thought, the heart, the seat of the emotions, and the liver, the seat of desire. Soul atoms are inhaled with

¹ Arist., *Met.*, I, 4.

² Arist., *De Gen. et Corr.*, I, 2.

³ For the merely subjective character of sense perception in Democritus, see Brett, *History of Psychology*, I, 43 ff.

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the breath, and exhaled again into the outer air, and upon this constant flow of soul atoms life depends. At death the soul atoms are dispersed, the soul, as an individual being, perishing, although the separate atoms continue their existence.

The feature of the atomistic system which has proved of the greatest historical importance is of course the mechanistic interpretation of nature, the elimination, as an explanatory hypothesis, of any purposive category, like intelligence, soul, or the like, and the substitution therefore of natural law and necessity (*ἀνάγκη*). Motion is with Democritus, as with the early hylozoists, an intrinsic property of matter, and all effects whatever are explained by the weight and shape, and the consequent motions of atoms.

It is not difficult to discern in Democritus the ancient prototype of modern mechanistic theories of life, as of the world as a whole. "Democritus has nothing in common with primitive animism or the Homeric notion of the soul, and his attitude on the question of the soul's nature is obviously the result of viewing man only as an object. With this bias he thinks primarily of the actions of the will, to the exclusion of knowledge, and volition seems to be a power of motion possessed by a 'body' as its own nature. The body in question is called soul on account of its distinctive features, namely, the spherical shape, fineness, and mobility of its parts."⁴ It would be difficult to give a more accurate brief description of the modern mechanistic and behaviorist position

⁴ Brett, *op. cit.*, p. 44.

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than these words used to describe the fundamental attitude of Democritus. It will be abundantly seen, when we come to the discussion of modern theories of intelligence and instinct, from Descartes and Gassendi to Bethe and Loeb, that there is little in the modern conceptions, apart from the elaboration of details impossible in Democritus' day, that was not expressed, in principle, in Greek atomism.

The mechanistic interpretation of nature inaugurated by Leucippus and Democritus, as well as some beginnings of animal psychology, are continued in Epicurus and Lucretius, and in Plutarch of Chæronea, to whom we return after tracing the further development of the dualistic tendency in the great systems of Plato and Aristotle.

THE voluminous writings of Democritus are largely lost, but important fragments remain. The main sources are Lucretius, *De Rerum Natura*, and Aristotle, *Met.*, I, 4, *De Cælo*, III, 2, and *De An.*, I, 2. For the fragments see Mullach, *Dem. Abd. Opera fragmenta*; Ritter and Preller, §§75-91; Burnet, *Early Greek Philosophy*, Ch. IX; see further, Brieger, *Die Urbewegung der Atome*; Brett, *History of Psychology*, I, Pt. I, Ch. IV; Hart, *Zur Seelen- und Erkenntnisslehre des Demokrit*; Liepmann, *Die Mechanik d. Leucipp-Demokritischen Atome*; Lange, *History of Materialism*, I, Ch. I; Löwenheim, *Die Wissenschaft Demokrits*; Klemm, *History of Psychology*; Liard, *De Democrito philosopho*; Masson, *The Atomic Theory of Lucretius*; Papencordt, *De atomicorum doctrina*; Gomperz, *Griechische Denker*, III, Ch. II; Heidel, *Antecedents of Greek Corpuscular Theories* (Harvard Studies in Classical Philology); Zeller, *Pre-Socratic Philosophy*; Ersch u. Gruber, *Allg. Encycl. d. Künste und Wissenschaften*, Vol. 24; Heimsoeth, *Democriti de anima doctrina*; Siebeck, *Geschichte der Psychologie*; Ziegler, *Begriff des Instinktes einst und jetzt*, p. 5 ff.

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II

The large conceptual distinctions of the bodily and the mental, causation and intelligence, which came to be incorporated so thoroughly in subsequent philosophy, and are today a part of the working vocabulary of biology and psychology, were first clearly elaborated by Plato (427-347), although, as we have seen, important anticipations of these distinctions are found in previous thinkers, particularly in Empedocles and Anaxagoras, and in the atomists, Leucippus and Democritus. The extent to which Plato was influenced by Democritus is doubtful. That he was a student of the science of his day is evident from the dialogues, especially the *Timæus*, many of the ideas of which, particularly the description of the central nervous system, and the location of the soul in the brain, are of Democritic origin.⁵

The distinction between body and soul does not apply only to man, but is merely an illustration of the duplex character of the universe as a whole. The idea of man as a microcosm, so common in subsequent philosophy, the idea that the dual organization of man is only a repetition of the dual aspect of nature, finds in Plato its first clear enunciation. The world soul, too, has its counterpart in the physical universe, the order and proportion found in the latter being due to the operation of intelligence (Anaxagoras). There are two fundamental principles in nature, mind and matter, mind

⁵ Cf. Löwenheim, *Die Wissenschaft Demokrits*, and Brett, *op. cit.*, p. 66.

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being "that to which everything owes its form and essence, the principle of law and order in the universe; while the other element, matter, is secondary, a dull, irrational, recalcitrant force, the unwilling slave of mind. Form is the active, matter the coöperative cause. It is both friend and foe, an auxiliary and an obstruction, the ground of physical and moral evil, of change and imperfection."⁶

The dualism of soul and body in man, however, is complicated by the further division of the soul into two parts or functions, the rational and the irrational, the rational soul being located in the head, the irrational in the body, below the head. The irrational soul, in turn, comprises two parts, the spirited part, manifesting itself in energy and courage, and located in the breast, and the appetitive and nutritive part, located in the abdomen. We have thus a tripartite division of the soul into the deliberative or rational soul (λογιστικόν), the emotional or spirited soul or will (θυμοειδές), and the appetitive soul, which feels the cravings connected with the organic needs (ἐπιθυμητικόν). This threefold division corresponds, moreover, to the three levels of organic life, plant, animal, and man, plants possessing the nutritive or appetitive soul, animals the spirited or courageous soul, while man has, in addition to these two, the faculty of reason,⁷ an analogy carried out in more detail, as we shall see, in Aristotle.

The relationship of the three parts of the soul to each other, and to the essence of the soul itself, is by no

⁶ Thilly, *History of Philosophy*, pp. 65-66.

⁷ Tim. 77; Rep. 441, 588.

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means clear in Plato. Whether the two lower functions are really parts of the soul, or whether they are merely conditions growing out of the union of the rational soul with the body, or whether all three parts can subsist independently of each other, are questions of the greatest difficulty in Plato, and are all but impossible to decide in the light of conflicting statements in Plato's writings. The sharp opposition of the material and the ideal worlds in Plato's metaphysics, the existence of the two lower souls in plants and animals, the notion of the purification of the soul and its comparative emancipation from the domination of desire in virtuous activity, and finally the complete separation of the immortal part, the *νοῦς*, from the mortal, at death, all these conceptions naturally suggest the hypothesis of separability, although there are not wanting passages with a contrary significance.⁸

It is evident that what we nowadays call instinct was located by Plato within the lower, irrational soul, the seat of the emotions and organic cravings. The lower soul is incapable of self-originated motion, but only of chaotic and troubled movements which can apparently be regulated through the influence of the more perfect motions of the rational soul. The relation between the rational and the irrational souls is thus one of mutual interaction, in the sense that bodily desires can disturb and frustrate the operation of reason, and reason, with

⁸ The dialogues most relevant here are the *Phædrus*, the *Timæus*, the *Phædo* and the *Republic*. See also Ueberweg, *op. cit.*, I, 127; Windelband, *History of Ancient Philosophy*, pp. 204 ff.; Steger, *Die platonische Psychologie*; Siebeck, *op. cit.*, 2 Absch., 2 Kap., and literature cited there.

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the assistance of "spirit," can, in turn, exercise control over desire. In this eternal "Wechselspiel von Hemmen und von Streben," this struggle between the spirit and the flesh, as later theology has it, the moral life consists.

Just how the interaction between the parts of the soul is to be represented Plato is no more successful in illustrating than are modern dualistic theories. "Plato does not show us how reason can be affected by the inferior parts of the soul and fall under their dominion: nor does he explain why courage (spirit) is in its very nature subject to reason. . . . We have here three essences combined with one another; not one essence operating in different directions."⁹

Since the rational soul (λογιστικόν) is denied to the lower animals, their life is governed by the merely vegetative and organic impulses. Thus, by accentuating the differences between the lower animals and man, Plato contributes importantly to the sharpening of the concept of instinct as a separate faculty over against intelligence, the prerogative of man, a tendency carried forward by Aristotle, Stoicism, and scholastic theology, and persisting into modern times. A more detailed treatment of instinct, in the narrower sense, is not to be found in Plato, although important anticipations of recent genetic theories of instinct are contained in Plato's theory of reminiscence (ἀνάμνησις), according to which all knowledge is merely the revival of experiences or ideas existing congenitally.

The relation between the Platonic theory and modern

⁹ Zeller, *Plato and the Older Academy*, p. 418.

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evolutionary conceptions was early noticed by Grote. "The doctrine of reminiscence, declared and illustrated by Socrates in the Platonic Menon bears much analogy to the Development Hypothesis espoused by Mr. Herbert Spencer; an extension and special application of the larger views opened by Mr. Darwin respecting the origin of species. Each individual animal is assumed to begin existence with a large stock of congenital predispositions and aptitudes engrained in its nervous system as the result of an 'infinitude of past experiences,' not indeed of its own but of its progenitors. Hence arise all its instincts, and many of its mental combinations which go beyond instinct."¹⁰ The relation between these Platonic ideas and the modern doctrine of instinct as "unconscious memory" is very striking, and could profitably form the subject of a separate investigation. But the matter cannot be followed further here.

THE literature on Plato is extensive. For bibliographies see Teuffel, *Uebersicht der platonischen Literatur*. For Plato's works see *Opera*, ed. J. Burnet; Jowett, *The Dialogues of Plato*. Schleiermacher's translation is an epoch-making work in the literature on Platonism. For general works see Chaignet, *Histoire de la psychologie des Grecs*; also by the same author, *De la psychologie de Platon*; Fouillée, *La Philosophie de Platon*; Grote, *Plato and the other Companions of Socrates*; Funke, *Platon's Lehre von den Seelenvermögen*; Gardiner, "The Psychology of the Affections in Plato and Aristotle," *Phil. Rev.*, November, 1918; Gomperz, *Griechische Denker*, Buch V, Kap. VIII; Lange, *History of Materialism*, I, Ch. III; Mill, *Dissertations and Discussions*, Vol. IV; Ritchie,

¹⁰ Extract from the MSS. of Grote's papers in the Bodleian Library, Oxford. Quoted by Hammond, *Aristotle's Psychology*, p. 195, note 1.

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Plato; Pater, *Plato and Platonism*; Siebeck, *Geschichte der Psychologie*; Stein, *Sieben Bücher zur Geschichte des Platonismus*; Simson, *Der Begriff der Seele bei Plato*; Ueberweg, *Geschichte der Philosophie* (11 ed.), I Teil, §§ 39-44, esp. § 42; Windelband, *Platon* (Frommanns Klassiker series, Vol. IX); Wildauer, *Platons Lehre vom Willen*; Zeller, *Plato*; Archer-Hind, "On Some Difficulties in the Platonic Psychology," *Journal of Philology*, X; Schewczik, *Platons Lehre v. d. Seele*; Ziegler, *Begriff des Instinktes einst und jetzt*.

III

The vast system of natural philosophy associated with the name of Aristotle (385-322), the Secretary of Nature, as Suidas has called him,¹¹ shows a fundamental relation to the system of Plato in its teleological and dualistic conception of nature, although, in the view of the soul as merely a name for the life principle, which pervades the entire realm of living beings, in the closer identification of "form" and "matter," the ideal and the material aspects of existence, and in his empirical theory of knowledge, which seeks to trace the connection between sensation and the highest conceptual knowledge, he doubtless approaches an intermediate position between the naturalistic theories of atomism and the extreme dualism of Plato, a tendency which becomes still more strongly expressed in certain post-Aristotelian writers, notably Strato and Theophrastus, and in Stoicism, as we shall see presently.

All things whatever, according to Aristotle, are a combination of matter and form, and can be arranged in an ascending scale, from the inorganic to the living,

¹¹ Hammond, *op. cit.*, p. XVI.

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on the basis of the degree to which form is incorporated or realized in a given object. The distinction between the inorganic and the organic is therefore not the distinction between the formless and the formed, since there is nothing in nature wholly devoid of form. The distinguishing mark of the organic is the power of self-movement, which is of several types, namely nutrition (*τὸ θρεπτικόν*) and reproduction, possessed by plants, nutrition, reproduction, sensation (*τὸ αἰσθητικόν*), appetite (*ὀρεκτικόν*) and consequent locomotion (*κινητικὸν κατὰ τόπον*), found in animals, and, finally, all these powers, with the further addition of reason (*τὸ διανοητικόν*), found in man. The various functions or forms of animation are called souls by Aristotle, and the difference between the organic and the inorganic might then be said to be the presence or absence of soul (*τὰ ἔμψυχα* and *τὰ ἄψυχα*). The Platonic partition of the soul into distinct entities or parts (*μέρη*), which were assigned to separate parts of the body, thus gives place in Aristotle to a genetic series of functions in which the lower function is included or incorporated in the higher: the lower can exist without the higher, but the higher always¹² presupposes and operates in connection with the lower.¹³

The Platonic division of the soul into the rational

¹² With the exception of the active reason, an obscure conception which we shall not discuss further here. On the whole subject of the passive and the active reason, see Hammond, *Aristotle's Psychology*, Introduction, VIII; Brentano, *Psychologie des Aristoteles*; Zeller, *Aristotle*, II, Ch. XII, and literature cited there. Also Chaignet, *Essai sur la psychologie d'Aristote*, and Siebeck, *op. cit.*

¹³ For Aristotle's view of the relation of his divisions to those of Plato, see *De An.*, Book III, Ch. IX.

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and irrational parts, while thus recurring in Aristotle, tends to be obliterated by certain important observations regarding the activities of the "sensitive" soul, which must be set out somewhat in detail. The distinctions Aristotle draws will be seen, not only to make a significant advance upon Plato, but to anticipate strikingly the more modern views of the nature of animal behavior, although the intellectualistic view which Aristotle shared with Greek science in general misled him into a too psychological interpretation of activities which nowadays would be regarded as merely physiological.

So far, then, from drawing a sharp distinction between the mental life of animals and that of man, a tendency found in the scholastic followers of Aristotle throughout the Middle Ages and in modern times, it is rather Aristotle's merit to have made the first important beginnings toward a truly genetic conception of mental life by naming the gradations separating the lower from the higher manifestations of intelligence in the series of living beings. This interpretation of Aristotle is the more justified in view of the highly ambiguous character of the "active reason" in Aristotle's system, a surviving remnant of Orphic psychosophy and of Platonism, which was seized upon by later theological writers in order to establish the unique and privileged position of man in nature. The genetic treatment of mental life is only a part of Aristotle's general view of organic nature, which entitles him to be included among the most important forerunners in antiquity of the modern doctrine of organic evolution. The animal kingdom, according to Aristotle, "exhibits a gradual

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and continuous progression from the poorest and most undeveloped forms of life to the highest, and it is Aristotle's undisputed distinction to have first discovered this scale and to have followed it through all aspects of animal life."¹⁴

The sensitive or animal soul possesses, in addition to the nutritive and reproductive functions of plants, the functions of sensation, imagination, memory, pleasure and pain, desire and aversion, and locomotion. Aristotle's observations on the relations of these processes to each other show an extraordinary acuteness, and resemble remarkably modern theories of conation advanced by writers who appear to be singularly unconscious of the important anticipations of these theories by the great Stagirite.

The processes of sensation, imagination, and memory belong together inasmuch as the image is, in Aristotle's view, a weakened or spent sensation, sensation being the sense impression received from an external stimulus, while the image or phantasm (*φάντασμα*) is the sense impression persisting or recurring in a weaker form, owing to the continuance of sense movements in the sense organs, the blood and the heart, like whirlpools in water, after the cessation of the external stimulus. If the image is recognized as having occurred in the past it becomes memory (*μνήμη*). Memories might then be defined as images accompanied by the consciousness of being a part of past experience.

¹⁴ Zeller, *op. cit.*, p. 38, note 1; p. 85. On the general subject of Aristotle's relation to the theory of evolution see Meyer, *Aristoteles Thierkunde*, and Osborn, *From the Greeks to Darwin*, pp. 43-57.

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Memory is usually said to be attributed by Aristotle to the lower animals, but the textual evidence is conflicting on this point, as Aristotle more than once denies memory to animals on the ground that the judgment of time, which is presupposed in memory, is absent in animals. From memory, in the sense defined, Aristotle distinguishes voluntary recollection (*ἀνάμνησις*), which is found only in man.

From sensation and imagination arise pleasure and pain, desire and aversion, and locomotion, locomotion being due to appetite, and appetite, in turn, depending upon cognitive processes, like sensations or ideas. Desire, according to Aristotle, depends upon a cognitive process, and is impossible without it.¹⁵ This unmodern, intellectualistic conception is noteworthy for the history of psychology, as it reveals clearly that Aristotle, although acquainted in a general way with the facts of heredity,¹⁶ did not recognize the purely hereditary and mechanical character of important groups of animal and human activities, his psychology as a whole being essentially preëvolutionary in this respect, and dominated by conceptions derived from a one-sidedly introspective treatment of the higher processes in human beings.

In the higher reaches of human activity desire becomes will (*βούλησις*) through the participation of the rational soul (*νοῦς*), which is the prerogative of man.

¹⁵ "Desire, however, is not found apart from imagination, and all imagination is either rational or sensitive in origin, and the lower animals share in it." *De An.*, Book III, Ch. X.

¹⁶ See *Gen. An.*, I, 35, and *Hist. An.* Cf. Brock, *Biol. Centralblätter*, VIII, p. 491 ff.

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In virtue of the possession of reason, man becomes a being intermediate between the animals and God. In sensibility, imagination and memory, and in desire and passion, he is related to the animals below him; in virtue of the presence in him of reason, he is akin to God. Man is the only moral being, for morality is possible only through the mingling of animal and rational principles. Hence arose the traditional classification of living beings into the lower creatures, devoid of reason and moral sense, man, the rational animal, possessed of moral will, a complex of reason and desire, and, finally, God, who is pure reason. Hence also the two types of soul recognized by scholasticism, the *anima sensitiva*, belonging to the brute creation, and the *anima intellectualis*, the prerogative of man.

Aristotle's observations on the structural peculiarities of mobile organisms, like the animals, the division of the body into right and left halves, and into front and back, distinctions which are based upon the position of the sense organs, remind one strongly of recent tropistic theories of animal behavior, although the general intellectualistic trend of Aristotle's psychology, his idea that bodily movements can be actuated and inhibited by pleasure and pain, and, finally, his predilection for teleological methods of explanation, renders the classification of Aristotle as anything but a vitalist wholly impossible. One of the best known exponents and historians of the vitalistic conception views him, indeed, not only as the typical representative of vitalism in antiquity and the Middle Ages, but also as "a

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typical precursor of all vitalistic theories until the most recent times."¹⁷

ARISTOTLE, *Opera*, by Bekker; *The Works of Aristotle translated into English*, ed. J. A. Smith and W. D. Ross, Oxford University Press, now in process of publication, is the standard edition of Aristotle in English. See also the translations of the *De Anima*, by Hammond, by Hicks, and by Wallace. For general works on Aristotle see the following: Brett, *History of Psychology*, I, Pt. I, Chs. X-XIV; Gomperz, *Griechische Denker*, esp. Kap. XI-XVII; Grote, *Aristotle*; Brentano, *Die Psychologie des Aristoteles*; Volkmann, *Die Grundzüge der aristotelischen Psychologie*; Lange, *History of Materialism*, I, Ch. III; Chaignet, *Essai sur la psychologie d'Aristote*; Lewes, *Aristotle*; Klemm, *History of Psychology*; Osborn, *From the Greeks to Darwin*, pp. 43-57; Rodier, *Aristote, Traité de l'Âme*; Siebeck, *Geschichte der Psychologie*; Siebeck, *Aristoteles* (in Frommann series); Waddington-Kastus, *De la Psychologie d'Aristote*; Seidel, *Die Lehre des Aristoteles vom Now*; Ueberweg, *Geschichte der Philosophie*, I Teil, §§ 46-53, esp. § 50; Dessoir, *Abriss einer Geschichte der Psychologie*; Harms, *Philosophie in ihrer Geschichte*, I. *Psychologie*; Neuhäuser, *Aristoteles Lehre von dem sinnlichen Erkenntnisvermögen und seinen Organen*; Zeller, *Aristotle and the Earlier Peripatetics*; Poppelreuter, *Zur Psychologie des Aristoteles, Theophrast, Strato*.

The philosophy of Aristotle was developed in two directions, (1) an orthodox, represented by Eudemus, who, influenced by Pythagorean and Platonic conceptions, emphasized the transcendence of the divine being in nature, and, in psychology, of reason; (2) a more independent, naturalistic direction, represented by Strato and Theophrastus, who stressed the idea of immanence in both metaphysics and psychology, and thus approach Stoicism and Epicureanism.

¹⁷ Driesch, *History and Theory of Vitalism*, p. 12.

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Theophrastus, the successor of Aristotle as head of the Peripatetic school, over which he presided for thirty-five years, interpreted thought (*νοῦς*) as merely an instance of motion (*κίνησις*), and different from the other functions of the soul only in degree, not in kind. Theophrastus was the author of a lost work¹⁸ on the intelligence and habits of animals, in which he emphasized the relationship between man and the lower animals, not only as regards physical characteristics, but the life of feeling and intelligence as well.

A still more distinctly anti-Platonic direction is given to the Aristotelian tradition by Strato, the successor of Theophrastus as head of the Peripatetic school, who rejected completely the distinction between reason and the so-called lower faculties, denying the existence of *νοῦς* as a separate principle. Similarly, in metaphysics, Strato taught the naturalistic origin of the universe, denying the existence of pure form, and extra-mundane causes. The world as a whole is explainable by qualities and forces resident in things, and operating under a law of natural necessity. Chief among these forces are warmth and cold, of which warmth plays the more active and productive rôle. Psychical activities are motions of material particles.

The soul is not of supersensible origin, and has no separate existence. Sensation and thought imply each

¹⁸ Called, according to Meursius, *περὶ ζώων προνοήσεως, καὶ ἡθους*. (Joannes Meursius, *Theophrastus. Sive, De illius libris, qui injuria temporis interciderunt*, 1638.) The work from which Porphyry quotes an extended extract is Theophrastus' tract, *On Piety* (*περὶ εὐσεβείας*), for which see the discussion of Porphyry, *De Abstemientia*, below.

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other, sensation being incomplete without thought, and thought being limited to a perceptual content.

Strato was known as "the physicist," and his interests lay primarily in the field of the philosophy of nature, so that his opinions on the more detailed questions of psychology and animal psychology, in so far as he had formulated them, must be deduced largely from the general positions in his metaphysics which have been indicated. From these it may be safely concluded that the division between man and the lower creatures on the basis of the presence and absence of reason, which played so predominant a part in mediæval psychology and its modern counterparts, found no place in Strato's system, which does not lie on the main line of development from Aristotle to scholasticism, but represents an aberrant movement in a naturalistic and pantheistic direction. It was consequently destined to comparative neglect and sterility, owing to the decay of the scientific spirit, and the concurrent growth of mystical and theological attitudes toward philosophical questions. There are two further systems, however, which share the point of view of these important critics of the Platonic-Aristotelian world-view, namely Stoicism and Epicureanism, to which we now turn.

THEOPHRASTUS, *Opera*, ed. Schneider. See also, Ueberweg, *Geschichte der Philosophie*, I Teil, §§ 54 (Theophrastus) and 67 (Strato); Bernays, *Theophrastos' Schrift über Frömmigkeit*; Philippson, "Υλη ἀνθρωπίνη; Achelis, "Theophrastus, De Pietate," *Classical Quarterly*, 1911; Poppelreuter, *Zur Psychologie des Aristoteles, Theophrast, Strato*.

CHAPTER III

Post-Aristotelian Schools

Stoicism and the Epicureans

I

RIVALLING the systems of Plato and Aristotle in its importance for the elaboration of various psychological distinctions, particularly of the concept of instinct, is Stoicism, which, although generally regarded as a transitional stage between the Aristotelian and the mediæval traditions, and belonging to the general type of "idealistic" or dualistic systems, nevertheless exhibits a close relationship to the atomistic and materialistic system of Democritus, and the mechanistic interpretation of life generally, thus continuing the naturalistic movement inaugurated by Theophrastus and Strato, which has just been briefly outlined. While the great dualistic distinction elaborated by Plato and Aristotle between the formative and plastic principles in nature, and between the lower, irrational propensities and reason, in psychology, survive in Stoicism, nevertheless, both reason and form are no longer immaterial principles, still less forces which operate upon the lower elements from without as transcendental agencies. All differences are differences of degree. The soul or reason of the world is merely an all-pervading force operating according to law. As in nature every particle of matter has some degree of activity, so the so-called irrational animal impulses are not wholly irrational. Animal im-

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pulse, although mentioned in contrast with reason, which assumes an extraordinarily weighty rôle in Stoic ethics, is itself really unconscious reason, an example, merely, of the rational and purposive aspect of nature throughout.

Not only so, but, since the corporeal cannot be acted upon by anything not corporeal, all bodily movements are actuated by physical causes. Hence the ends reached by such purposive processes as instincts are reached through the operation of physical agencies, every teleological process being at the same time a causal process, operating under the law of natural necessity. It is evident that the introduction of the concept of unconscious purposive process due, not to the action of some discarnate spiritual principle, but to the action of mechanical forces, marks an unmistakable advance in the interpretation of nature and life in the direction of the modern mechanistic conception. That this is really the posture of affairs in Stoicism will become increasingly clear after the more detailed exposition of the Stoic metaphysics and psychology, to which we proceed.

Reality, according to Stoicism, is throughout corporeal or material, differing only in degrees of density, or in degree of activity, the finer, more tenuous substances, like fire and air, being more active and mobile, the coarser and denser, like earth and water, being more passive, inert, and immobile. The first are formative, determining, the latter formed and determined. The modern concepts of force and matter would be roughly parallel with the Stoic concepts of activity and passivity if we think of force as itself only a subtle form of

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matter, which actuates, and thus organizes, through the different degrees of tension or *tonus* it possesses, the coarser and more inert materials upon which it works.

The concept of tension, apparently originated by the Cynic Diogenes, is of central importance in Stoic metaphysics, since it is eventually through the varying amounts of tension contained in substances that their dynamic efficacy, and hence their share in the process of becoming, is explained. The phenomenon of expansion of an object with the rise in its temperature led to the natural assumption that heat was responsible for the displacement of the constituent particles of the body. The primitive pneuma contains the greatest possible amount of tension, which is relaxed and weakened as the primitive pneuma becomes successively differentiated into fire, air, water, and earth. The lowered tension and activity is due to the diminished supply of the pneumatic element. Life is due to the presence of pneuma, and an organism continues to live only so long as it is sufficiently supplied with warmth and breath. As the pneuma becomes reduced, the living organism becomes a merely inorganic substance. Even in this condition, however, pneuma is present, manifesting itself as cohesion, otherwise the object would cease to be an object, and become a formless nothing.¹

The order or organization in nature is therefore due to a formative agent, but, since, according to a fundamental Stoic doctrine, only body can act upon body, this formative agent is no immaterial agent or sub-

¹ On the concept of *tonus* see, further, Ravaisson, *Essai sur le Stoicisme*, and the works of Zeller, Stein, and Siebeck.

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stance, like the *νοῦς* of Anaxagoras or the Platonic ideas, but a material force, acting in strict conformity to law, but realizing, through an immanent teleology, the endless variety of shapes and constellations seen in nature. The identity of the Stoic pneuma, the *λόγος* of Heraclitus and the *νοῦς* of Anaxagoras, the Platonic ideas, and the Aristotelian entelechy, is unmistakable, but Stoicism expressly emphasizes the corporeality of its cosmic principle, thus approaching closely the psychological ideas of the atomists, who saw in the more nimble and active atoms constituting the soul the explanation of the phenomena of control and regulation which Stoicism ascribed to its own formative principle, the fiery breath or soul of the world.

The primordial principle (*λόγος σπερματικός*) specifies itself in multitudes of particular formative agents (*λόγοι σπερματικοί*), manifesting themselves as cohesion (*ἔξις*) in the inorganic realm, in plants as organization (*Φύσις*), in animals as life (*ζῶον*), in man as soul (*ψυχή*). The soul of the individual, also, is fiery breath.²

The individual forces which animate and control the separate members are also spirits (*spiritus animales*), whose activities appear to be connected with the circulation of the blood. The seat of the pneuma is the heart, whence it ramifies through the body, like the arms of a polyp. There are seven pneumata, one for each of the

² The seventeenth century term for psychology was pneumatics. Compare the derivation of the English word spirit (from *spirare*, to breathe). On the history of the pneuma doctrine see Baldwin, *Dictionary of Philosophy and Psychology*, and note 11, p. 3, *supra*.

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five senses, one for reproduction, and one for speech. The similarity between these views and the ideas regarding the distribution of soul atoms in Democritus will be evident.

The materiality of the soul is proved by the following arguments: (1) Mental traits, as well as physical, are transmitted from parents to offspring, which would be impossible if the soul were not a material substance. (2) The apparent interaction between soul and body proves the soul's corporeality, as only body can act upon body. (3) The escape from the body of warm breath or pneuma results in death, proving that pneuma is the principle of life. Finally, (4) the soul must be corporeal since it occupies tridimensional space, as it extends itself through the body.

In the spirit of the Platonic-Aristotelian tradition, Stoicism distinguishes between a lower, impulsive, tendency or instinct (*ὁρμή*, the verb form is *ὁρμᾶν*, to incite, stir up; cf. Lat. *instinguere*, from which the Engl. instinct is derived) and reason, the former being characteristic of the lower animals, the latter of man. The irrational animal is not strictly speaking an *ἔμψυχον*, as the plant is not a *ζῶον*, but something analogous (*ἀναλογοῦν τι*) and lower, an undeveloped or nascent soul (*ἐντελέστερα*). The later Stoics sought to fix this distinction by adopting the two terms, *ψυχή* and *νοῦς*, the former belonging to animals, the latter to man. The one thing, in any event, on which the earlier as well as the later Stoics are agreed is that the animal "soul" is something intermediate between mere organism (*φύσις*) and soul proper (*ψυχή*), and which

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might be called life. The stages of development might, then, be designated as matter (ἐξῆς), organization (φύσις), sentiency or life (ζῶον), and soul or reason (ψυχή), the stages being determined by the fineness and tension of the pneuma present in the successive levels of development.

The grades of nature in Stoicism, although reminiscent of the Aristotelian divisions, differ from the latter, as is seen, in the express denial of life to plants and of soul to animals, the phenomenon of animation being more definitely confined, in Stoicism, to the higher stages of development.³ The important point of agreement between the Aristotelian and the Stoic views is the denial of soul proper, or reason, to animals, an opinion which was destined to play a leading part in the history of subsequent psychology. On this feature of Stoic psychology we must dwell a little more fully, since there is an apparent contradiction between this position and the general views of Aristotle and Stoicism regarding the existence of "form" and rationality throughout the whole realm of nature, from the lowest stages to the highest, and particularly the Stoic view of the so-called lower impulses as manifestations of reason, since nature is throughout a rational and purposive system. The latter idea has its analogue in Aristotle not only in the assertion of the existence everywhere in nature of form, but in the more special idea of grades of soul or types of vital organization, the lower serving as means and stepping stones to the higher.

³ Cf. Stein, *Psychologie der Stoa*, I, pp. 87 ff.

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The apparent contradiction between the notion of the universal prevalence of reason and the other idea which has enjoyed a great vogue in the history of psychology, that reason is a specifically human capacity, will largely disappear when we remember the Aristotelian idea of an ascending series of forms or types of order, an idea already elaborated in Plato and recurring in Stoicism. It would perhaps not be too remote from the facts to say (although the modern phraseology does not occur in antiquity) that in both Aristotle and Stoicism a valid distinction exists between unconscious and conscious reason, the former manifesting itself in varying grades throughout nature, from the lowest inorganic bodies to man, the latter appearing only in man.

A further important similarity exists between the Aristotelian and the Stoic conception of the relation between mechanical and final causation. It was Aristotle's settled conviction (in contrast with Empedocles and Democritus), that two kinds of causes, final and motor, "must, as far as possible, be taken into account in explaining the works of nature, or that at any rate an attempt must be made to include them both."⁴ For Aristotle and Stoicism, as well, mechanism and teleology, as Henderson aptly says, "are complementary aspects of nature, which are always associated in its manifestations."⁵

While, then, the concept of mechanico-teleological process, difficult as it may seem nowadays, was accepted by both Aristotle and Stoicism, a difference apparently

⁴ De Part. An., I, 1, 642a, 15.

⁵ L. J. Henderson, *The Order of Nature*, p. 17.

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existed in the conception of the nature of final cause, Stoicism, as explained above, tending to interpret finality in a more objective and descriptive sense, thus developing the notion of immanent or internal teleology, in contradistinction to the more Platonic notion of transcendence, from whose influence Aristotle had not so completely emancipated himself. Aristotle's forms, like Plato's ideal archetypes, are immaterial essences acting upon a refractory material medium, while in Stoicism, though traces of the Platonic dualism remain, the formative agents are envisaged as ponderable substances or forces, operating according to necessity. The term reason, in Stoicism, is merely a name for the order of nature, objectively considered.

Viewed in this light, the sharp dualism in Stoic ethics between the lower impulsive, passionate tendencies on the one side and reason on the other, cannot but be felt as out of harmony with their metaphysical system as a whole. As Windelband says, "the possibility of unnatural and unreasonable phenomena, as they are supposed to appear in the passions, is absolutely irreconcilable with the metaphysical development of the Stoics' doctrine, and with their idea of fate and providence. Their ethical dualism and their metaphysical monism stand in absolute contradiction."⁶

Viewed within the framework of the Stoic system as a whole, the animal instincts appear as only one example of numerous types of formation or adaptation, such as cohesion, in the inorganic realm, or the formation of the embryo, the processes of growth and repair, or

⁶ *History of Ancient Philosophy*, p. 310.

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reflex and voluntary movement, or any other adaptive activities, in organisms. Everywhere we have to do with teleological processes which, at the same time, take place in a material medium and are activated by mechanical agencies. Stoicism thus seems to me to approach very near to a large class of scientific thinkers today, for whom Henderson might be presumed to speak when he uses the following language: "It seems to me clearly established in the history of thought that when this problem [of adaptation] arises the only safety is to be found in retreat and in employing the vaguest possible term which can be imagined, from which all implication of design or purpose has been completely eliminated. By common consent that term has come to be recognized as *teleology*. Thus we say that adaptation is teleological, but we do not say it is the result of design or purpose."⁷

Stoicism, as a philosophical system, is of very composite origin, and it consequently embodies a number of teachings only loosely connected with each other, to the point, occasionally, of actual incoherence. The eclectic character of Stoicism is further enhanced by the fact that the attitude of scientific neutrality was often abandoned in the interest of practical and religious concerns, a tendency which had in a measure vitiated the great system of Plato.

As a consequence, there are not wanting in Stoicism ideas strikingly at variance with the main trend of the metaphysics, and it would be vain to pretend that we have to do with a closely argued body of doctrine such as is suggested by the outline of the Stoic teaching

⁷ Henderson, *op. cit.*, p. 204.

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sketched above, which must be understood to represent at best the most characteristic feature, or that which proved philosophically the most important.

So, in particular (not to dwell upon other instances more remote from our immediate task), the doctrine of internal teleology and the pantheistic conception seem often to be given up in favor of transcendence, and the providential supervention of God in the processes of nature and the affairs of man. It is doubtless this tendency encountered in the writings, for example, of that inveterate popularizer, Cicero, which justifies the severe strictures of Stoicism by a writer of the authority of Windelband, who, although recognizing the great service of Stoicism in preserving the valuable Democritean principle of the universal reign of law in nature, which Aristotle himself had grasped only imperfectly, rates Stoicism below Aristotle in the conception of teleology. "In this assumption of natural necessity, admitting of no exceptions even for the most particular and least important occurrence . . . the Stoic school . . . is the only school in antiquity which carried this most valuable thought of the great Abderite through all branches of theoretical science. In all other respects, indeed, the Stoics stand in opposition to Democritus and in closer relation to Aristotle. For while in the Atomistic system the natural necessity of all that comes to pass results from the motive impulses of individual things, with the Stoics it flows immediately from the living activity of the whole. . . . They directed their polemic particularly against the purely mechanical explanation of natural processes by pressure and impact; but in carry-

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ing out their teleology, they sank from the great conception of Aristotle, who had everywhere emphasized the immanent purposiveness of the formations in which the Forms were realized, to the consideration of the benefits which flow from the phenomena of nature to meet the needs of beings endowed with reason, 'of gods and men.'⁸ In particular, they exaggerated, even to ridiculous Philistinism, the demonstration of the manner in which heaven and earth and all that in them is, are arranged with such magnificent adaptation for man.'⁹

In the discussion of instinct, as elsewhere, we find the Stoics employing alternately the idioms of metaphysics and of theology, an evil example in which they were followed throughout the Middle Ages and right into modern times. The natural promptings called instincts are purposive activities implanted in the animal by nature or by the world reason or creator for the guidance of the creature in the attainment of ends useful to it, in its own preservation or the preservation of the species, and the avoidance of the contrary. Apart from the vague ascription of instinct to "nature" or even to providence, and the unfortunate introduction of the notion of design, the account of instinct, on the descriptive side, approximates very closely the modern formulation, and is entirely noteworthy.

The Stoics remarked the following characteristics of instinct: (1) Its congenital character, its independence of experience; (2) its adaptive function or utility; and (3) its uniformity as opposed to the variable nature of

⁸ Cicero, *De Fin.*, III, 20, 67; *De Nat. Deor.*, II, 53 ff.

⁹ *History of Philosophy* (Engl. tr.), p. 181 f.

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the learned activities. Apart from genetic and natural selectionist ideas, impossible in their day, the Stoics thus furnished a definition of instinct still satisfactory to Kirby and Spence when they wrote in 1858: "We may call the instincts of animals those faculties implanted by the Creator, by which, independent of instruction, observation or experience, and without knowledge of the end in view, they are all alike impelled to the performance of certain actions tending to the well-being of the individual and the preservation of the species."¹⁰

VON ARNIM, *Stoicorum Veterum Fragmenta*; Pearson, *The Fragments of Zeno and Cleanthes*; Barth, *Die Stoa*; Brett, *History of Psychology*, I, Pt. I, Ch. XV; Capes, *Stoicism*; Dyroff, "Zur stoischen Tierpsychologie," *Blätter für Gymnasialwesen*, 1897; Davidson, *The Stoic Creed*; Hicks, *Stoic and Epicurean*; Lange, *History of*

¹⁰ Cf. the following more recent accounts of instinct: "If it can be shown that instincts vary ever so little, then I can see no difficulty in natural selection preserving and continually accumulating variations of instinct to any extent that was profitable. It is thus, as I believe, that all the most complex and wonderful instincts have originated." (Darwin.) "Instinct is a general term comprising all those faculties of mind which lead to the performance of actions that are adaptive in character, but pursued without necessary knowledge of the relation between the means employed and the end attained." (Romanes.) "The primary roots of instincts reach back to the constitutional properties of protoplasm." (Whitman.) "Instinct is usually defined as the faculty of acting in such a way as to produce certain ends, without foresight of the ends, and without previous education in the performance. Instincts are functional correlatives of structure. With the presence of a certain organ goes, one may say, almost always a native aptitude for its use." (James.) "Instinct is inherited faculty, especially inherited habit." (Eimer.) "Instinct, as distinguished from reason, attains adaptive ends without prevision and without experience. . . . Instinctive actions belong to the reflex type—they consist of coördinated reflex acts." (Folsom.)

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Materialism, I, Ch. I; Bonhöffer, "Zur stoischen Psychologie," *Philol.*, 1895; Heinze, *Zur Lehre vom Logos*; Siebeck, *Geschichte der Psychologie*; Siebeck, *Die Umbildung der peripatetischen Naturphilosophie in die der Stoiker*; Stein, *Psychologie der Stoa*; Stahl, *Mensch und Welt*; Zeller, *Stoics, Epicureans, and Sceptics*; Chaig-net, *Histoire de la Psychologie des Grecs*; Dessoir, *Abriss einer Geschichte der Psychologie*; Klemm, *History of Psychology*; Windelband, *History of Philosophy*, esp. pp. 178-190; Ueberweg, *Geschichte der Philosophie* (11 ed.), esp. §§ 55-59; Ziegler, *Begriff des Instinktes einst und jetzt*.

II

The teleological and supernaturalistic features in the philosophy of Plato and Aristotle and in Stoicism are combated by Epicurus (340-270) upon the basis of the metaphysics of Democritus which Epicurus sought to rehabilitate, without, however, adding anything essential to the ideas of his great predecessor, the existence of atoms and of empty space, and the mechanical interaction of these ultimate constituents of reality. The only important innovation, indeed, which Epicurus attempted, the theory of a spontaneous or chance deviation, at some point of time, from the perpendicular fall of the Democritean atoms, in order to make possible the formation of composite bodies, and to furnish a metaphysical basis for free will, proved to be an unlucky venture, since Epicurus thus abandoned the one idea of fundamental value in Democritus, the idea of universal causal relation and mechanical necessity, in the interest of which Stoicism itself had rendered valuable service.

The cruder aspects of Stoic teleology, however, Epi-

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cureanism opposed by an outspoken naturalism which denied the interference with the order of nature or the course of human events by supernatural agencies. In the construction of its purely secular philosophy of nature it resorted to the familiar concepts and principles of the atomistic philosophy, with only such additions or modifications as were due to the influence of the great dualistic systems which had been erected since Democritus, or were prompted by pragmatic rather than purely scientific motives.

The only realities are atoms and empty space, which are alike uncreated and indestructible. The atoms are infinite in number, and have only the quantitative characteristics of shape, size, weight, and motion. Through the mechanical collision and consequent grouping of atoms, objects and worlds come gradually into being. The notion of design is replaced by the Empedoclean notion of the survival of those aggregations which prove suitable or fit, the rest being discarded. In both Empedocles and Epicurus we thus find the two central ideas of the modern Darwinian theory of development, the chance production of a great variety of forms, and the selection, by natural agencies, of those best suited to the conditions of existence.

The Epicurean theory of mind, like that of Democritus, is wholly consistent with these naturalistic premises. The soul, too, is composed of fine, aëriiform atoms, which are distributed throughout the body. The soul has an irrational and a rational part (Lucretius calls them *anima* and *animus* respectively), the former being distributed throughout the body, the latter having

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its seat in the breast. The fate of the soul is bound up with that of the body, the one maturing, declining, and perishing with the other. At death the soul atoms are dispersed, with a resulting loss of individuality, although the separate atoms continue to exist. There is, finally, a theory of sense perception based upon mechanical principles, and following the main lines laid down by Democritus, to the effect that perception is due to particles representative of the object (*εἰδωλα*), which detach themselves from things, and make their way through the intervening air and into the sense organs.

The system of Democritus was formulated about three decades before Platonism (Democritus and Plato were born 460 and 427), and bears few or no traces of Platonic influence, although, as we have seen, Plato was doubtless acquainted with the main ideas of the Democritean system. The rather incongruous dualistic features found in Epicureanism, and the respects in which it proved less consistent than its earlier prototype, the arbitrary deflection of atoms, the division between the rational and irrational parts of the soul, a distinction which is equally illogical in Stoicism and in Epicureanism, these were features undoubtedly due to the intervening influences of Plato and Aristotle, and the gradual surrender of the purely scientific attitude in favor of moral and practical considerations, a defection from which Stoicism, as we have seen, had also suffered.

The naturalistic point of view of Epicureanism enabled it to take up a position on the matter of animal intelligence markedly different from that occupied by

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the rival systems of Aristotle and Stoicism, and entitles Epicureanism to special mention in the history of animal psychology, particularly since the Epicurean views exerted a distinct influence upon subsequent writers on animal psychology in antiquity, like Plutarch and Porphyry, and upon the great forerunners of the English and French Enlightenment, and of modern anthropomorphic tendencies, men like Montaigne, Rorarius, Gassendi, Condillac, Leroy, and Rousseau, who determined the main lines of non-Aristotelian psychology in modern times.

In spite of the principle of continuity of organic evolution which he had asserted, Aristotle had denied reason and moral capacity to animals, an attitude in which he was followed by Stoicism, thus drawing a sharp distinction between the lower animals and man. Epicureanism, although not teaching the descent of higher from lower forms of animal life, and thus departing from the Darwinian evolutionary conception already taught by Aristotle, did much to mitigate the alleged difference between man and the animals in the matter of mental endowment. There are interesting observations on the analogies existing between the expressive activities of animals and human speech, the assertion of moral obligation toward animals, counsels of abstinence from animal food, based, apparently, upon ideas of the relationship between animals and humans, and the like. These tendencies were carried forward by two writers of considerable importance for the history of animal psychology in antiquity, Plutarch and Porphyry.

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THE numerous writings of Epicurus have been almost entirely lost, only detached sayings and fragments being preserved. The most important sources are Diogenes Laertius (Book X), Lucretius, whose great poem, *De Rerum Natura*, gives an elaborate exposition of the Epicurean system, Seneca and Cicero. The fragments are collected by Usener, *Epicurea*. See further, Brett, *History of Psychology*, I, Pt. I, Ch. XVI; Brieger, *Epikurus' Lehre v. d. Seele*; Hicks, *Stoic and Epicurean* (good bibliography); Goedekemeyer, *Die Naturphilosophie Epikurs in ihrem Verhältniss zu Demokrit*; Kreibitz, *Epicurus*; Lange, *History of Materialism*, I, Chs. IV-V; Osborn, *From the Greeks to Darwin*, pp. 59-64; Ueberweg, *Geschichte der Philosophie*, I, §§ 60-63, esp. § 62; Zeller, *Stoics, Epicureans, and Sceptics*; Santayana, *Three Philosophical Poets*; Wallace, *Epicureanism*; Windelband, *History of Philosophy*, esp. pp. 178-190; A. E. Taylor, *Epicurus*; Pater, *Marius the Epicurean*; Joyau, *Epicure*; Woltjer, *Lucretii Philosophia cum fontibus comparata*.

CHAPTER IV

Psychologizing Tendencies

Plutarch, Celsus, and Porphyry

I

TAKING the term animal psychology in the sense of an explicit discussion of the mental characteristics of animals, as distinguished from a general treatment of biological and psychological topics, on the background of metaphysical theories, such as we encounter, for example, in Democritus, Aristotle and Stoicism, Plutarch of Chæronea (*c.* 45-*c.* 125), most widely known as the author of the "Lives," a Platonist strongly influenced by the Pythagorean revival in the first century, might be said to be the first animal psychologist in antiquity.

His philosophical and ethical ideas are mainly contained in a number of Platonic commentaries and a series of controversial pieces written against the Stoics and Epicureans, and in the "Moralia," which purport to be an exposition of Platonic ideas, developed in opposition to the monistic and pantheistic tendencies of Stoicism, although Plutarch's ethical discussions often come to little more than a restatement, sometimes even a mere transliteration, of ethical writings of Stoic origin.

Plutarch's philosophical ideas have but little connection with his attitudes in animal psychology, the philosophy developing along Platonic lines, whereas his views on animal psychology seem to owe their char-

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acter partly to Pythagorean influences, but show a certain resemblance, also, to Epicureanism, a system to which Plutarch otherwise stands strongly opposed.

Plutarch's philosophical position is a pronounced dualism not only in cosmology and theology, where God, the principle of goodness, is set over against matter, the principle of evil, but also in psychology, where Plutarch follows the Platonic tripartite division of the soul into reason, will, and passion,¹ with which, however, he sometimes combines the more elaborate Aristotelian classification, yielding a total of five faculties, the threptic and sensitive functions of Aristotle, and the familiar Platonic heads enumerated above. Apparently of Aristotelian and Stoic origin, also, is the separation of *νοῦς* from *ψυχή*, resulting in the triad so familiar in popular psychology of today, of body, soul, and spirit (*σῶμα*, *ψυχή*, *νοῦς*), the soul being conceived as more essentially connected with the body, the spirit's relation to the inferior parts being, as in Aristotle, more extraneous.² In the Plutarchian ethics we also encounter the Aristotelian distinction between the theoretical and the practical reason (*λόγος θεωρητικός*, *λόγος πρακτικός*) the function of the latter being the regulation of the impulses of the irrational soul, with a view to the attainment of a mean between excess and defect (*ὑπερβολή* and *ἐλλειψις*).³

These characteristic Aristotelian and Stoic standpoints hardly prepare us for the views on animal psychology expressed in the three principal Plutarchian writings

¹ *De virtute morali*, 3.

² *De genio Socratis*, and *De facie in orbe lunæ*.

³ *De virtute morali*, 5.

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devoted to the subject, *De solertia animalium*, *Bruta ratione uti* (Gryllus), and *De esu carniū*, which combat the traditional Aristotelian and Stoic opposition between the rational and the irrational, and deny any essential distinction, based upon asserted mental differences, between man and the lower animals. In Plutarch, indeed, we see in full swing that psychologizing and humanizing tendency begun by Pliny (23-79) before him, carried to such extremes in modern times by Montaigne and the Age of Enlightenment, and to some extent by Darwin, Romanes, and the early evolutionists, who, animated by the desire to minimize the differences between man and the lower animals, likewise argued that "there is no fundamental difference between man and the higher mammals in their mental faculties."⁴ The controversy between the Stoic view and Plutarch is renewed in modern times in the two extremes of interpretation of animal conduct, the physiological and the psychological, represented by such writers as Descartes and Montaigne in the early modern period, and by such writers as Bethe, H. E. Ziegler, and von Uexkuell, on the one side, and Claparède, Forel, and Wasmann, on the other.⁵

Plutarch's interpretations of animal behavior are based upon upward of a hundred instances of a more or less anecdotal character, drawn from a variety of sources, Plutarch himself having contributed few or no observations of his own.⁶ These are subjected to little

⁴ Darwin, *Descent of Man and Selection in Relation to Sex*, p. 66

⁵ Cf. M. F. Washburn, *The Animal Mind*, pp. 13 ff.

⁶ Cf. Dyroff, *Die Tierpsychologie des Plutarchos von Chazoneia*, pp. 57 ff. Also Wellmann, *Hermes*, 1891, pp. 481 ff.

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criticism or analysis, the tendency throughout being to account for the extraordinary skill and adaptability evinced in the behavior of animals, which would today be explained by instinct, trial and error learning, associative memory and habit, by assuming a sagacity equal to them.

As a result of this method, Plutarch attributes to animals the following mental traits, among others: Sense perception, whose high development he emphasizes, dwelling especially upon the acuity of the olfactory sense, and its utility to the animal in the presence of prey, and in the search for food and mates; anticipatory sensation, enabling the animal to foretell weather changes, and the like; representation, memory, conception, judgment, reflection, logical inference, attention, expectation, hope, impatience, the beginnings of speech, imitation, the love of music, a knowledge of remedies for disease, of dietetics, optics, surgery, of arithmetic, astronomy, mantics, and theology! Of moral qualities possessed by animals Plutarch notes the following: Moderation (*σωφροσύνη*) in food, drink, and sex, cleanliness, endurance, courage, fair play, attachment, sociability, conjugal fidelity, parental, filial, and conjugal devotion, frugality, docility, gratitude, obedience, contentment, industry, good will (*εὐνοία*) and the sum of all the virtues, wisdom (*σοφία*). These virtues are, to be sure, balanced by a number of vices, such as cowardice, foolhardiness, intemperance, injustice, ruthlessness, cruelty, ingratitude, envy, hatred, and rage.

The empirical evidence for the close relation existing between man and the lower animals, and for the

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existence of intelligence in animals, is reënforced by certain general arguments, the chief of which are the derivation of all things from the divine reason, the fact that intelligence is necessary for the interpretation of sensation, the possibility of metempsychosis (Pythagoras and Empedocles), the occurrence in animals of mental aberration and madness, and the existence in animals, denied by Aristotle and the Stoics, of a moral disposition and a moral sense.

The argument that the view of animals as rational and moral beings would prevent their use and employment for human purposes, which would lead to impractical absurdities, and would jeopardize the very existence of the human species, Plutarch answers by maintaining that it is legitimate to make use of animals so long as no injustice is done them, and no cruelty practiced. Such a precept would forbid the wanton destruction of animals for mere amusement, as in the chase and in gladiatorial shows, and would limit the human diet as far as possible to vegetable food. Cruelty toward animals has a brutalizing effect upon those who practice it, while kindness and humanity toward them promotes similar sentiments in men toward each other.

These and similar ideas are further developed by the Neo-Platonist Porphyry.

ENTIRE text in Teubner series, and in the Didot Bibliotheca; *Moralia*, Wytttenbach ed.; also by King (Bohn Library); and by Goodwin; Ritter and Preller, pp. 507 ff. See further, Volkmann, *Leben, Schriften und Philosophie des Plutarch*; Brett, *History of Psychology*, I, Pt. II, Ch. III; Dassaritis, *Die Psychologie und Pädagogik des Plutarch*; Dyroff, *Die Tierpsychologie des Plutarch von Chairon*.

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neia; Mommsen, *History of Rome* (last volume); Ueberweg, *Geschichte der Philosophie* (11 ed.), §70; Scheitlin, *Thierseelenkunde*; Ziegler, *Begriff des Instinktes einst und jetzt*, pp. 18 ff.

II

A forerunner⁷ of Porphyry of some importance is the Platonist Celsus, the first literary opponent of Christianity, whose "True Discourse" or "Truth About the Christians" (*ἀληθὴς λόγος*), written between 177 and 179, and known to us mainly through Origen's reply to it,⁸ anticipated Porphyry's attack upon Christianity, particularly his argument against the divinity of Christ, the infallibility of the Scriptures, and the anthropomorphic interpretation of nature. Celsus, like Plutarch, emphasizes the divine transcendence, and the impossibility of incarnation without sharing the imperfections and ills intrinsic to the bodily life. As in Neo-Platonism and Porphyry, also, the gap between God and the physical world is bridged by a hierarchy of superhuman beings, who coöperate with God in the government of the world.

Of special interest for our purpose is Celsus' attack upon the anthropocentric dogma of Christianity, and his denial of the position that animals derive their sole importance from their relation to the needs of man.

⁷ Erroneously placed before Plutarch and after Neo-Platonism and Porphyry by Scheitlin (*op. cit.*, I, p. 157). The historical order is of course Plutarch (45-125), Celsus (exact date unknown, but belonging to the second half of the second century), Plotinus (203-269), and Porphyry (c. 232-c. 300).

⁸ Celsus' work has been reconstructed from Origen's *Contra Celsum* by Theodor Keim, *Celsus' wahres Wort wiederhergestellt*, 1873.

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Drawing his illustrations mainly from insects and birds, today the favorite subjects for the illustration of instinct, he seeks to show that animals are in no way inferior to man, possessing a social organization, the power of spatial orientation, of communication, general ideas and reason, and a knowledge, exceeding that of man, of what is useful and harmful to them. Like Plutarch, Celsus dwells upon the prescience of animals, especially birds, and their special adaptability, on account of the quickness of their intelligence and movements, for the purpose of augury and soothsaying, and as instruments of the divine will. Celsus' main positions in philosophy and theology, to which are added a number of Neo-Platonic ideas, and sundry psychological and ethical notions, reappear in Porphyry, with whom we close the consideration of the ancient period.

Porphyry of Tyre (c. 232-c. 300), the foremost disciple of Plotinus, the founder of Neo-Platonism, author of biographies of Pythagoras and Plotinus, and of commentaries on Plato and Aristotle, the most important of which is his *Introduction to the Categories of Aristotle*, which came to exert a world-wide influence in the Middle Ages in Latin, Syrian, Arabic, and Armenian translations, and of numerous other works on philosophy, religion, mathematics, astrology, rhetoric, and grammar, comprising some seventy-seven titles, is praised by Eunapius principally for his services in editing and expounding the works of Plotinus, which Porphyry issued under the title of *Enneads*. Of interest to the historian of Christian theology is his work, burned in 448 by order of Theodosius II, "Against the Chris-

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tians" (κατὰ χριστιανῶν), which denied the divinity of Christ, and undertook a textual criticism of the Biblical scriptures which anticipates remarkably the attitudes and methods of modern biblical criticism.

Porphry's comments on animal psychology, contained in a very interesting small work, *On Abstinence from Animal Food* (περὶ ἀποχῆς τῶν ἐμψύχων),⁹ have an observable relation to his philosophical position, the broad outlines of which are as follows.

The whole empirical world is derived from an original primal source (τὸ πρῶτον), the undifferentiated, indefinable One, whence it emanates, becoming in successive stages spirit, soul, and matter (νοῦς, ψυχή, μὴ ὄν). As light gradually fades into darkness, so the divine essence, although gradually depleted as it passes down through the successive grades of being, still remains in some degree present until the lowest stage of materiality is reached. Thus all things short of pure matter itself, which is the very principle of sterility and evil (πρῶτον κακόν), are animated, and are separated from each other, according to the principle of emanation, by countless grades of intermediate forms, from pure intelligence through the world soul, the souls of men and animals, arriving, finally, at pure matter.

The doctrine of emanation or descent finds its complement in the doctrine of return (ἐπιστροφή). The goal of all earthly things is to retrace the path of their descent, and to make their way back again to their

⁹ See J. Bernays, *Theophrastos' Schrift über Frömmigkeit, ein Beitrag zur Religionsgeschichte, mit krit. u. erkl. Bemerkungen zu Porphyrios' Schrift über Enthaltbarkeit*, 1866.

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divine source. The liberation of the soul from the material and the sensual and its reabsorption in God constitutes man's ethical task. The return path is again marked by three successive stages, purification, contemplation, and mystical union through ecstasy.

This age-old moral quest of man is depicted with great eloquence by Porphyry in the First Book of *De Abstinencia*. The passage is typically Neo-Platonic. "He who wishes to return to his proper kindred and associates, should not only with alacrity begin the journey, but, in order that he may properly be received, should meditate how he may divest himself of everything of a foreign nature which he has assumed, and should recall to his memory such things as he has forgotten, and without which he cannot be admitted to his kindred and friends. After the same manner, it is necessary, if we intend to return to things which are truly our own, that we should divest ourselves of everything of a mortal nature which we have assumed, together with an adhering affection towards it, and which is the cause of our descent. . . . For we were intellectual natures, and we still are essences purified from all sense and irrationality; but we are complicated with sensibles, through our incapability of associating with the intelligible, and through the power of associating with terrestrial concerns. . . . We must therefore divest ourselves of our manifold garments, both of this visible and fleshly vestment, and of those with which we are internally clothed, and which are proximate to our cutaneous habiliments; and we must enter the stadium

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naked and unclothed, striving for the most glorious of all prizes, the Olympia of the soul."¹⁰

I have reproduced the nowadays rare text of Porphyry at some length because it reveals in a striking manner one of the chief motives of Porphyry's tract in defence of animals. In addition to a growing feeling of humanity, which may have been responsible for the increasing interest in man's moral relation to animals, a number of other considerations can be found scattered throughout Porphyry's book, especially the notion of the kinship of animals and men, since both have sprung from a common divine source, and the kindred notion of metempsychosis, derived directly from Pythagoreanism, according to which souls, not sufficiently purified, enter at death the bodies of other men, animals, or plants. It is, however, the ascetic motive, prompting the philosopher to abstain from all earthly allurements which might hinder the soul in its moral task, which furnishes the principal clue to Porphyry's attitude. The philosopher's interest has definitely shifted, in Neo-Platonism, from the search for truth to moral and practical ends. The salvation of the soul (*ἡ τῆς ψυχῆς σωτηρία*) has become the avowed aim of philosophy, and it is fundamental to the understanding of Porphyry to grasp this fact. Still, the main argument is buttressed throughout by other considerations, particularly that of the psychical relationship of the animals to man. It is from these features that Porphyry's treatise derives its principal interest for the history of psychology, and to these we turn briefly in conclusion.

¹⁰ *Select Works*, Taylor tr., pp. 21-22.

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The book¹¹ purports to be addressed to one Firmus Castricius, a friend and fellow disciple, who after having adopted a fleshless diet has returned to animal food, and is intended to disclose his error by "argumentative discussion." It is of interest that Porphyry explicitly develops his own views in contrast to those of the "Peripatetic and Stoic sects," appealing frequently, on the other hand, to Pythagoras and Empedocles, and to Plutarch.

Book I is devoted to moral arguments for a vegetarian diet along Platonic lines. Sense, as Plato said in the *Phædo*, is the nail by which the soul is fastened to the body, and it can be liberated only after "the oblivion and death of the passions." But the passions are fed by the senses, and to be purified from these is most difficult, and "we must bestow much labor both by day and by night to be liberated from attention to them.

Whence, also, we should as much as possible withdraw ourselves from those places in which we may, though unwillingly, meet with this hostile crowd." (35) "For where sense and sensible apprehension are, there a departure and separation from the intelligible takes place; and by how much stronger the excitation of the irrational part, by so much greater is the departure from intellection." (41) "But from all these,

¹¹ Brett has a slight opinion of Porphyry's sincerity: "Porphyry's object is merely polemical, and we cannot treat his remarks on animal psychology as a serious contribution to the subject. As a Neo-Platonist he has a quarrel with the Christian sects, and fastens on their habit of eating flesh as a proof of their moral depravity; they devour creatures that have souls like their own. The accusation requires to be supported with some proof that the said animals have souls in any sense like those of men and Christians." (*A History of Psychology*, vol. II, p. 30).

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inanimate and slender food . . . will liberate us, and will procure for us peace, by imparting salvation to our reasoning power."

The observations on animal psychology proper are contained mainly in the third Book, which is for our purposes the most important in the treatise. The mental powers Porphyry finds in animals are (1) sense perception, which far exceeds that found in man (III, 8); (2) memory, "which is the most principal thing in reasoning and prudence" (III, 10); (3) imitation, as in crows, magpies, the robin redbreast, and the parrot (III, 4); (4) speech, which is often understood even by man, like Melampus, Tiresias, and Apollonius of Tyana, who knew of a swallow which by its twittering "indicated to other birds that an ass laden with corn had fallen down before the city, and that in consequence . . . the corn was spread on the ground," and like a certain boy servant "who understood the meaning of all sounds of birds, and who said that all of them were prophetic and declarative of what would shortly happen" (III, 3); (5) logical inference, as in dogs, which reason that prey must have fled by one of three roads, "but it has not fled either through this or through that, and therefore it must have fled through the remaining third of these roads," an example borrowed from Plutarch (III, 6); (6) an æsthetic sense, as in crabs, fishes, stags, and horses, which are allured by the harmony produced by reeds and flutes, and others which learn to dance and play on the pipe and the harp (III, 15).

Like Plutarch, Porphyry also finds in animals the

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human virtues and vices, like chastity and conjugal fidelity, justice, fortitude, gratitude to benefactors, jealousy, envy, injustice, timidity, intemperance, and malevolence; but their vices are "of a lighter nature than those of men," and their bad qualities are not so prevalent (III, 10); they commit injustice and cruelty through want and hunger, but we through insolent wantonness and for the sake of luxury (III, 20). As in Plutarch, the presence of delirium and madness is cited as proof of the presence normally of reason (III, 7), and a religious sense is asserted. Some, like Socrates and Rhadamanthus, swore by animals, and some, like the Egyptians and Greeks, even conceived them to be gods, or symbolic of divinity (III, 6).

Enough has been said to illustrate the uncritical character of Porphyry's observations. The term reason is used as broadly synonymous with what would today be loosely called animal intelligence, including sense perception, memory, instinct, and emotional responses, as well as logical inference proper. Intelligence is said to be present in a lower degree than in man, but "it does not follow, if we have more intelligence than other animals, that on this account they are to be deprived of intelligence, as neither must it be said that partridges do not fly, because hawks fly higher" (III, 8). The difference between our reason and theirs, Porphyry concludes, appealing to the authority of Aristotle, does not consist "in essence, but in the more and the less" (III, 7).

There are a few points of a general character which are of interest, as showing Porphyry's historical affilia-

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tions and indicating his general philosophical positions. There is a significant reference (III, 21) to Strato's position¹² "that it is not possible to have a sensible perception of anything without the energy of intellection. . . . For the objects which fall on the eyes and the ears do not produce a sensible perception of themselves, unless that which is intellective is present." Hence, he concludes, intellect must be assumed to be present wherever perception is present (III, 21).

There is a long section (III, 25), believed to be based directly upon Theophrastus' work, *On Piety* (περὶ εὐσεβείας), one of the principal sources for Porphyry's *De Abstinentia*, in which Theophrastus argues for the relationship between man and animals, not only from their common origin, but from structural analogies and the common possession of mental traits. "They all have the same food and the same spirit, the same purple streams; and they likewise demonstrate that the common parents of all of them are Heaven and Earth" (III, 25).

SELECT Works of Porphyry, Taylor translation. See also Bernays, *Theophrastos' Schrift über Frömmigkeit, mit kritischen u. erklärenden Bemerkungen zu Porphyrios' Schrift über Enthaltbarkeit*; Purpus, *Die Anschauungen des Porphyrius über die Tierseele*; Brett, *History of Psychology*, II, Pt. I, Ch. II; Ueberweg, *Geschichte der Philosophie* (11 ed.), §80; Ziegler, *Begriff des Instinktes einst und jetzt*, pp. 24 ff.

¹² See above, p. 28.

Scholasticism

THE philosophy of the Middle Ages contributed little to the development of psychological notions or to the conception of instinct. It is historically noteworthy mainly through the stereotyped form it impressed upon certain Aristotelian and Stoic distinctions, a form destined to be preserved until modern times, mainly in the ecclesiastical philosophy of Catholicism, and to become the main starting point for modern controversies.

The point of principal interest for our purpose is the sharp distinction, running throughout both the Arabian and the European writers, between man and the lower animals, the former being endowed with reason, the latter with sense perception and sense impulses. True to its preoccupation with man and man's destiny, mediæval psychology is indeed little more than a doctrine of reason, reason being supposed to be a faculty superadded to sense perception, and the prerogative of man. In the realist contention, particularly, the soul is in direct communication with the world of ideas, independently of the bodily senses. The sense impulse is adaptive in function, its adaptive character being ascribed directly to the creator. This position, gradually elaborated through St. Augustine (d. 430), Alcuin (d. 804), Rhabanus Maurus (d. 856), John Scotus Eriugena (d. 877), Hugh of St. Victor (d. 1141), comes to its climax in the great philosophers of the thirteenth century, Alexander of Hales (d. 1245),

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Albert the Great (d. 1280), and Thomas Aquinas (d. 1274).

A genuine insight into the difficulty of the dualistic doctrine is the observation of St. Albert that formation precedes the entrance of the soul into the body, a fact which he explains by the assumption of a *vis formativa*, a formative principle or agent, apparently operating below the level of soul life proper. We see here a characteristic vacillation between Platonic and Aristotelian standpoints, already evident in the notion of the teleological character of the sensitive impulse, referred to above.

A further Aristotelian feature is Albert's view of the vegetative, sensitive, and rational activities as merely different "degrees" or functions of the soul, instead of being "parts," in a separatist sense. There are sundry developments of Aristotelian psychology in a voluntaristic direction under the influence of Augustinian ideas, as in the doctrine of intentions, the recognition of a faculty of valuation (*vis æstimatoria*), and of certain desiderative and active tendencies (*vis concupiscibilis* and *vis irascibilis*), but there is no definite advance beyond the standpoint of the Aristotelian tradition. Indeed, Albert's conception of will (*perfecta voluntas*) as resulting from free choice (*liberum arbitrium*) between the promptings of reason and desire makes it clear that the admixture of Augustinian theological and mystical with scientific motives has become such as to make any fruitful development of a naturalistic interpretation of mental functions impossible.

The same statement applies to an even greater degree

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to Albert's celebrated pupil, Thomas Aquinas, in whom the theological philosophy of the Middle Ages attains its most systematic and final expression. For the statement of Brett, that "the most obvious feature of the whole movement called scholasticism is the steady restoration of Aristotle's doctrine," applies to St. Albert more than to Thomas Aquinas, in whom the Platonic and Neo-Platonic ideas come to preponderate more than in his great predecessor.

Thomas' most characteristic effort in this connection was his attempt to reconcile the organismic conceptions emerging in Aristotle with the separatist notions of the Platonic and Augustinian traditions. He seeks to accomplish this feat through the distinction between two kinds of forms, subsistent and inherent, the former existing independently of matter (*formæ separatæ*), the latter realizing themselves only through a material medium. The human soul is unique in being the only form which is both subsistent and inherent. It is separable and immortal, and at the same time the entelechy of the body. It thus becomes the mediating link between the lower creation, including the inorganic, plant and animal life, the realm of inherent forms, and the realm of pure ideas and spirits, culminating in the absolute, or God.

How the human soul can be both separable and inherent is not made evident. Thomas seems to be repeating the familiar device, seen in its most naïve and explicit form in Neo-Platonism, and by no means abandoned today, of overcoming psychophysical dualism by the insertion of numerous intergrades, without attempt-

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ing to give any detailed account of the dynamic relations existing between the different entities or functions alleged to exist.

The exposition of the different mental functions turns out as might have been anticipated from this unpromising beginning. The net result is the complete separation of the rational and the sensitive souls (*anima intellectualis* and *anima sensitiva*), which exist side by side in man, while only the latter is found in animals. Sensation, imagination, memory, and the affective life, with the bodily organization, form one realm; the intellect, independent of the body, forms another.

The explanation of animal and human activity thus involve wholly different categories. The animal is impelled by sense impulse, directed toward the pleasurable. Man's activity, although impulse plays a part, is motivated by rational insight into the relation between the act and its end, which is the realization of the good. "Apprehensio sensitiva non attingit ad communem rationem boni, sed ad aliquod bonum particulare, quod est delectabile. Et ideo secundum appetitum sensitivum, qui est in animalibus, operationes quæruntur propter delectationem." The contrasts expressed here between the general and the particular, between reason and sense, and between the good and the merely pleasurable, are all characteristic of the mediæval outlook.

The scholastic conception of animal activity is thus seen to represent a mean position between the psychologizing tendency which ascribes rationality to animals, and the modern mechanistic tendency which sees in animal behavior purely physiological processes, un-

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accompanied by consciousness. The mental processes ascribed to animals are sense perception, the memory traces of perceptual experiences, affective conditions, like pleasure and pain, and a rudimentary impulse (*appetitum*), unaccompanied by any rational apprehension of the teleology of action, or of moral distinctions. Man, situated midway, as it were, between earth and heaven, is related to the animals in his bodily organization, with its whole equipment of sense, imagination, and appetite; in virtue of his intellect and his moral nature, he is akin to God. It is an eloquent testimony to the power of the ecclesiastical organization that, apart from the specifically theological parts of the doctrine, neither modern scholarship nor popular thought has made much progress beyond the Platonic and Aristotelian distinctions as preserved by the great mediæval philosophers.

THE most important of St. Augustine's works on psychology are, in the order of composition, *De Libero Arbitrio*, *De Trinitate*, and *De Civitate Dei*. See Migne collection, Engl. tr., ed. by Dods. The principal works are also found in Schaff, *Nicene and Post-Nicene Fathers*. See further, Werner, *Die augustin. Psychologie*, and *Der Augustinismus in der Scholastik*; Dorner, *Augustin*; Storz, *Die Phil. d. hlg. Augustin*. The principal works of St. Albert are his *Summa Theologiæ* and *Summa de Creaturis*. On Albert see also v. Hertling, *Albertus Magnus u. d. Wissenschaft seiner Zeit*; Bach, *Albertus Magnus*; Schneider, *D. Psychologie Alberts d. Grossen*; Sighart, *Albertus Magnus*. The main works of Thomas Aquinas are his *Summa Theologiæ* and the *Summa contra Gentiles*. See also Sertillanges, *S. Thomas d'Aquin*; Jourdain, *La Philosophie de St. Th.*; Frohschammer, *D. Philosophie d. Th. v. Aquin*. On scholasticism in general see further, Ueberweg-Heinze, *Gesch. d. Phil.*, II,

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esp. §§ 15-37; Windelband, *History of Philosophy*; Willmann, *Gesch. d. Idealismus*; Harnack, *History of Dogma*; Siebeck, "Zur Psychologie d. Scholastik" (*Arch. f. Gesch. d. Phil.*, I-III); Stöckl, *History of Med. Philosophy*; Dilthey, *Einleitung i. d. Geisteswissenschaften*; De Wulf, *History of Medieval Philosophy*; Turner, *History of Philosophy*; Haureau, *Philosophie Scholastique*; Maher, *Psychology*; Rickaby, *First Principles of Knowledge*; Wasmann, *Instinct and Intelligence*; Ziegler, *D. Begriff d. Instinktes einst und jetzt*; Brett, *History of Psychology*, II, Pt. II.

CHAPTER VI

The Renaissance

Montaigne

WE pass briefly over the Renaissance, since little of significance for the history of animal psychology and of instinct has emerged from this period. The one writer of eminence who discusses questions germane to our topic is Montaigne, and Montaigne, as is evident at a glance, does little more than reproduce the views of animal intelligence familiar to us from our treatment of the psychologizing tendency of antiquity, in the philosophy of Neo-Platonism and Neo-Pythagoreanism.

It is clear that the aim of the story-teller eclipses all other aims in Michel de Montaigne (1533-1592), and he deserves a place in the history of animal psychology mainly on account of the extraordinary vogue of the great essayist in his day and since, and on account of the definite influence he exerted over certain writers of the Enlightenment period, and over popular conceptions of animal intelligence as well.

Montaigne's comments on animals are scattered throughout his celebrated *Essays*, first published at Bordeaux in 1580, but the most connected statement is found in an extended piece, *Apology for Raymond Sebond*.¹ Sebond's work, *Theologia Naturalis*, in which

¹ Sebond, Sabonde, or de Sebonde, a Spanish physician, born at Barcelona, died 1432 at Toulouse, where he was professor of Medicine and Theology.

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he undertakes, "by human and natural reasons, to establish and make good, against the atheists, all the articles of the Christian religion," Montaigne translated, at the behest of his father, from Spanish into French.² Montaigne's essay offers a defence of Sebond's book against those who hold that Christians are to blame for basing their belief upon human reason, "which is only conceived by faith, and the particular inspiration of divine grace."

It must be conceded that as a collection of pithy and unctuous anecdotes the *Apology* compares favorably with any similar collection of such stories in the history of literature, although as a critical account of animal intelligence it leaves a great deal to be desired. Montaigne, it appears, made few original observations of animal life, his animal lore being little more than a collection of rather incredible animal performances, and still more incredible interpretations, culled from a number of classical authors, from Pliny and Plutarch down.

A motive clearly discernible in Montaigne, which he shares with many of the more "free-thinking" writers, is to vindicate the rank of animals in nature, in comparison with that of man, whose conceit has ever prompted him to assign himself a unique place in the world, high above all the other creatures. He never tires of pouring his scorn upon man, whose weakness and vanity prevent him from taking a true view of himself, and of his real place in the world. "Presumption is our natural and original disease. The most

² The original Latin was first published in 1487, and was popular in France during the sixteenth and seventeenth centuries.

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wretched and frail of creatures is man, and withal the proudest. He feels and sees himself lodged here in the dirt and filth of the world, nailed and riveted to the worst and dearest part of the universe, in the lowest story of the house, the most remote from the heavenly arch, with animals of the worst condition of the three; and yet in his imagination will be placing himself above the circle of the moon, and bringing the heavens under his feet. 'Tis by the same vanity of imagination that he equals himself to God, attributes to himself divine qualities, withdraws and separates himself from the crowd of other creatures, cuts out the shares of the animals, his fellows and companions, and distributes to them portions of faculties and forces, as himself thinks fit."

It is often said that it is the capacity for language and communication which gives man his preëminence above the animals. But what do we see? A large part of language is the language of gesture and sign, and this we have in common with the brutes, although we have not taken full advantage of this means of communication between them and us. So Plato, in his picture of the golden age, names, among the chief advantages that man then had, his communication with the beasts, of whom, inquiring and informing himself, "he acquired a very perfect intelligence and prudence, and led his life more happily than we could do."

Of this universal language of gesture and sign men indeed make fuller use than they imagine. "Lovers are angry, reconciled, entreat, thank, appoint, and, in short, speak all things with their eyes." With the hands, "we

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require, promise, call, dismiss, threaten, pray, supplicate, deny, refuse, interrogate, admire, number, confess, repent, fear, express confusion, doubt . . . and what not." With the head, "we invite, remand, confess, deny, give the lie, welcome, honor, reverence, disdain, demand, rejoice, lament, reject, caress, rebuke, submit, huff, encourage, threaten, assure and inquire." The beasts have a very good knowledge of our meaning, as we have of theirs, and if we find communication with them difficult, "'tis yet to determine where the fault lies. The defect may be in our part as well as theirs."

In the interpretation of the activities of animals, no mention is made of anything corresponding to instinct, trial and error learning, imitation, the simpler associative processes, and the like; indeed, rejecting with scorn the notion of "some servile inclination," everything is explained by "judgment," "discretion," "conclusion," the higher, deliberative processes. Swallows, returning in the spring, search for the most commodious places for their nests. "Do they seek without judgment, and amongst a thousand choose out the most proper for their purpose without discretion?" In building their nests birds show a knowledge of the difference between a square and a round figure; between an obtuse and a right angle; they know the different qualities of the winds, of moss and of down; they know the action of water on clay. "Why does the spider make her web tighter in one place, and slacker in another; why now make one sort of knot, and then another, if she has not deliberation, thought and conclusion?" "Why should we attribute to I know not what natural and servile

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inclination the works that excel all we can do by nature and art?"

There follow a large number of extraordinary stories, some old, some new, of animal intelligence, all of them teaching the same lesson of resourcefulness and craft; of the fox that determines the thickness of the ice by laying his ear down to listen for the water's current, the fox arguing that "that which makes a noise runs, that which runs is not frozen, what is not frozen is liquid, and that which is liquid yields to impression"; of the wolves that tear the fisherman's nets if he does not leave them "an equal share of what he has caught"; of Aristotle's cuttlefish, reported by Plutarch, which casts a gut out of her throat and catches a fish nibbling at it by gradually drawing it in; of Chrysippus' dog, that at the parting of three ways, in the pursuit of his master, takes the third path without putting his nose to it, after having failed to find traces on the first two paths; of the oxen of the royal gardens of Susa, that, accustomed to drawing a hundred buckets of water a day, refused to draw one more; of the elephants in the spectacles of Rome that were taught to dance "to the sound of the voice, dances wherein were several changes and cadences very hard to learn," some of whom were "so intent upon their lesson as privately to practice it by themselves, that they might not be chidden or beaten by their masters"; of the magpie in the Roman barber-shop, for which the redoubtable Plutarch warrants, that upon hearing certain trumpeters sounding before the shop, "was pensive, dumb and melancholic; which everybody wondered at, and thought the noise of the

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trumpets had so stupefied and astonished her that her voice was gone with her hearing; but they found at last that it was a profound meditation and retiring into herself, her thoughts exercising and preparing her voice to imitate the sound of those trumpets, so that the first voice she uttered was perfect to imitate their strains, stops and changes”; of the dog (also Plutarch’s) that, unable to reach some oil at the bottom of a jar, “went and fetched some stones and let them fall into the jar till he made the oil rise so high that he could reach it”; of the ravens of Barbary that resort to the same expedient when the water they desire to drink is too low; of the similar act of the elephants “that when one of them is trapped in certain deep pits prepared for them, and covered over with brush to deceive them, all the rest, in great diligence, bring a great many stones and logs of wood to raise the bottom so that he may get out”; of the other elephant of Syria whose keeper robbed him of half of his allowance of barley, and that, when the keeper one day poured the full measure of barley into his manger, separated the one half from the other, and thrust it aside, “by that declaring the wrong that was done him”; and of yet a third elephant whose keeper mixed stones with his corn to make up the measure, for which the elephant filled the keeper’s meat pot, in which he was boiling his dinner, with ashes; of the philosopher Thales’ mule “who, fording a river, laden with salt, and by accident stumbling there, so that the sacks he carried were all wet, perceiving that by the melting of the salt his burden was something lighter, he never failed so oft as he came to any river, to lie

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down with his load; till his master, discovering the knavery, ordered that he should be laden with wool; wherein, finding himself mistaken, he ceased to practice that device."

Aristotle, Ælian, and Plutarch are authority for observations which show that tunnies have a "singular knowledge of the three parts of mathematics. As to astrology, they teach it men, for they stay in the place where they are surprised by the brumal solstice, and never stir thence till the next equinox"; they prove that they know geometry and arithmetic, for "they always form their numbers in the figure of a cube, every way square, and make up the body of a battalion, solid, close, and environed round with six equal sides, and swim in this square order, as large behind as before."

Animals possess various powers that seem to our author to imply miraculous forces that we cannot even conceive. So "in the great and last naval engagement that Antony lost to Augustus" (the story is from Pliny), "his admirable galley was stayed in the middle of her course by the little fish the Latins call remora, by reason of the property she has of staying all sorts of vessels to which she fastens herself." The emperor Caligula's galley, sailing on the coast of Romania was also stopped suddenly by the same fish. The cramp fish or torpedo has the power not only to benumb the hands that touch it, but even to transmit a heavy dulness through the nets in which they are caught, or even through a column of water poured upon it; "the cameleon takes her color from the place upon which she is laid," and the polypus even "gives himself what color he pleases."

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The ancients were already impressed with the divining faculty of birds and other animals, and Montaigne has a number of observations on this score. A citizen of Cyzicus, so Pliny tells us, was able to give the city correct predictions of the winds by observing the hedgehog which "has his burrow open in divers places, and to several winds, and, foreseeing the wind that is to come, stops the hole on that side." Hunters tell us that to cull out from amongst a number of puppies the best specimens, the best method is to leave the choice to the mother dog: if the puppies are taken out of the kennel, "the first she brings back will certainly be the best." The most ancient and certain predictions, according to Sextus Empiricus, were made from the flight of birds. Now, "that rule and order of the moving of the wing, whence they derived the consequences of future things, must of necessity be guided by some excellent means to so noble an operation; for to attribute this great effect to any natural disposition, without the intelligence, consent and meditation of him by whom it is produced, is an opinion evidently false."

But the superiority of animals is by no means confined to their intelligence; that they share in the moral sentiment, and are even religious, is equally clear. So animals are "more regular than we, and keep themselves with greater moderation within the limits nature has prescribed"; they league together and give each other mutual assistance; so "oxen, hogs and other animals, at the cry of any of their kind that we offend, all the herd run to his aid, and embody for his defence"; the fish *Scarus* will gnaw the line on which a

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fellow has been caught; "there is a like society between the little bird called the wren and the crocodile," the bird giving its friend warning of the approach of the crocodile's mortal enemy, the ichneumon, in turn for which the great animal receives the bird familiarly into his mouth, "thence to pick out the bits of flesh that remain; and when he has a mind to shut his mouth, he first gives the bird warning to go out by closing it little by little, and without bruising it or doing it any harm at all."

There is many another story of animal nobility: of the dogs that revenged the death of their masters; of another dog that pursued a sacrilegious thief carrying jewels out of a temple in Athens; of the lamenting of beasts at the death of those they love; of the magnanimity of the dog Alexander the Great brought from the Indies, which declined in turn encounter with a stag, a boar, and a bear, but "when he saw a lion he then immediately roused himself, evidently manifesting that he declared that alone worthy to enter the lists with him"; of a tiger's clemency toward a kid put in to him, suffering "two days' hunger, rather than hurt it"; of the repentance and contrition of an elephant, reported by Arrian, that "having in the impetuosity of his rage killed his keeper, he fell into so extreme a sorrow that he would never after eat, but starved himself to death"; and of the gratitude of a lion toward a slave, witnessed by Apion, which is however too long and too extraordinary for abbreviation.³

³ The reader should by no means deny himself the pleasure of reading this amazing yarn in its entirety. If he should thus be led to

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That elephants, at least, and perhaps other animals, have well developed religious propensities is clear from a story in Pliny, which was current in antiquity. After several washings and purifications, elephants "are observed to lift up their trunks like arms, and, fixing their eyes towards the rising of the sun, continue long in meditation and contemplation, at certain hours of the days, of their own motion, without instruction and precept. But because we do not see any such signs in other animals, we cannot for that conclude that they are without religion, nor make any judgment of what is concealed from us."

But how is it with humans? "We have for our part inconstancy, irresolution, incertitude, sorrow, superstition, solicitude of things to come, even after we shall be no more, ambition, avarice, jealousy, envy, irregular, frantic, and untamed appetites, war, lying, disloyalty, detraction, and curiosity. Doubtless, we have strangely overpaid this fine reason, upon which we so much glorify ourselves, and this capacity of judging and knowing, if we have bought it at the price of this infinite number of passions to which we are eternally subject." "Of what advantage can we conceive the knowledge of so many things was to Varro and Aristotle? Did it exempt them from human inconveniences? Were they by it freed from the accidents that lay heavy upon the shoulders of a porter? Did they extract from their logic any consolation for the gout? Or, for knowing how this humour is lodged in the joints, did they feel it the less?

rereading Montaigne, he might easily feel repaid for the tedium of my own abbreviations.

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. . . I have known in my time a hundred artisans, a hundred labourers, wiser and more happy than the rectors of the university, and whom I had much rather have resembled."

MONTAIGNE, *Essais*, ed. Courbet and Royer. English translations by Florio, ed. Morley; by Cotton, ed. Hazlitt. See Lévy-Bruhl, *Modern Philosophy in France*; studies of Montaigne by Bonnefon, Stapfer, Lowndes, Dowden, Bond, and Sichel.

Descartes and Animal Automatism

THE disastrous consequences of approaching philosophical problems from the twofold direction of scientific empiricism and of traditional theology are seen in their most glaring form in René Descartes (1596-1650), who, although often regarded as the founder of modern dualism, on account of his distinction between body and mind, as two diametrically opposed substances, and even of modern idealism, on account of his doctrine that the only reality incapable of being doubted is consciousness, is also claimed (as by de La Mettrie) as the most important originator of a materialistic and mechanical interpretation of nature. Descartes' whole literary activity was characterized by his anxiety to avoid offence to religious authority. But there is little doubt that the deductive and doctrinaire features of Descartes' system, by which he sought to placate religious orthodoxy, the complete separation of thought and extension, the proof of God and the material universe from the facts of consciousness, and the occasionalistic explanation of the interaction of body and mind, are the features which enjoy a constantly diminishing interest, while the mechanical conception of nature expounded by Descartes, and developed by Spinoza and Leibniz, is likely to prove the most significant contribution to intellectual progress made during the seventeenth century. It is in his mechanistic approach to the problems of life that Descartes also lays the founda-

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tions for new and fruitful studies of animal behavior, inaugurating, indeed, a new era in the field of psychology as well as in the field of the philosophy of nature. We pass to a brief exposition of these mechanistic doctrines.

The essential attribute of matter, according to Descartes, is extension. It is inert, i.e., devoid of autonomous energy, its movements being due solely to mechanical pressure and impact. Action at a distance is denied, as is empty space. Matter is not homogeneous in structure, but is composed of minute bodies of varying size and shape (corpuscular theory). The sum-total of matter and motion in the universe is constant (doctrine of the conservation of motion).¹

The physical universe is thus a vast mechanism within which every event is capable of exact mathematical calculation and prediction, by reference to purely physical causes (*causæ efficientes*), and independently of ends (*causæ finales*). Descartes, to be sure, traces the first origin of motion to the creator as the prime mover (*πρῶτον κινῶν*), thus proving himself inferior in logical consistency to Hobbes, who excluded this Aristotelian and Thomistic notion entirely from mechanical physics.² On the basis of these mechanical presuppositions Descartes undertook an explanation of the evolution of the planetary system, along the lines later taken by the theories of Kant and Laplace.

Descartes now proceeds to extend the notions of such wide-reaching applications in mechanical physics to the

¹ *Prima Phil.*, II, § 36.

² *Prim. Phil.*, I, 28. Cf. Windelband, *History of Philosophy*, IV, 2.

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realm of organic life as a whole, with the sole exception of man, a matter of extraordinary importance for the whole subsequent philosophy of organic nature. Organisms do not differ either in their composition or their activity from inorganic bodies. Plants and animals as well differ from inorganic substances only in degree of complexity. In short, the animal is a machine (*la bête machine*), life a mere mechanism. The movements of animals which we commonly view as the results of conscious processes, are from first to last physical operations, the effects of natural (i.e., non-psychical) causes, in the shape of nervous processes. In short, they are reflex in character. It follows, therefore, that the entire infra-human realm, embracing inorganic nature, plants, and animals, form one material system in which mechanical causes alone are operative. Descartes may thus also be viewed as one of the early propounders of the modern tropistic movement in biology, according to which the activities of plants and animals are merely "forced movements" or "tropisms," that is, are activated by physico-chemical agents, wholly independently of alleged psychical influences.³

The inclusion of man within the realm of nature, a seductive possibility, is rejected by Descartes, a circumstance which is partly explained by Descartes' subservience to the theological viewpoint of his age, which assigned man a special position and privilege in the universe, partly by the facts of empirical psychology,

³ See Loeb, *Forced Movements, Tropisms and Animal Conduct*, and literature cited there. For a fuller discussion of the tropistic hypothesis, see my forthcoming volume, *Instinct and Intelligence*.

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which strongly suggested the actual interpenetration of bodily and mental processes. The obvious difference between clear and obscure ideas, and affective conditions, led Descartes to assume an organic basis for the latter, since affective disturbances, and the consequent inroads upon freedom, could not be credited to a purely spiritual source, but must be sought in a disturbance of the soul by physical influences (*perturbationes animi*).⁴ Sense perception and memory also involve the participation of bodily processes, as do the instincts, which are not the acts of the soul, but have their origin in the body.

There result, therefore, the following distinguishable functions, arranged roughly in the order of increasing mentality, or, what comes to the same thing in Descartes, of activity or passivity (*actio, passio*): (a) Inorganic processes, and the functions of plant and animal life, including the merely bodily processes in man; (b) the lower mental functions in man, in which body and mind are alike involved (*mens unita cum corpore*), viz., sense perception (*sensus*), memory (*memoria*), imagination (*imaginatio*), the instincts and passions (*appetitus naturales, pathemata*), and obscure ideas (*confusæ ideæ*); and, finally, (c) activities in which the soul alone is concerned (*mens sola*), viz., intellect and will (*intellectus, voluntas*).⁵

The time-worn problem as to the manner in which the ponderable can act upon the imponderable, or how

⁴ Cf. Med. 5, 6; *Passions de l'âme*, I.

⁵ Cf. Falckenberg, *op. cit.*, p. 99; also Anton Koch, *Die Psychologie des Descartes*; and Kupka, "Willenstheorie des Descartes," *Archiv. f. Gesch. d. Phil.*, 1897.

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a psychical agent can operate within a purely physical universe, in which motion can occur only by mechanical impact, is solved by Descartes by the familiar device of reducing the difference between the two worlds as much as possible. Since the soul is inextended and unitary (its contents coalescing into a whole), it must have its seat at a single point of the body. This point Descartes located in the pineal gland (*glans pinealis*), an unpaired structure lying midway between the two cerebral hemispheres.⁶ Here the soul acts upon the animal spirits (*spiritus animales*), minute gaseous particles, which are otherwise, e.g., in animals, conceived as acting according to purely mechanical laws, like the atoms of Democritus.⁷

The action of the soul upon the animal spirits is conceived by Descartes in such a manner as to compromise as little as possible his mechanical theory of nature, and still maintain his interactionist position. The quantity of matter and motion in the universe, he had said, is constant. The soul can accordingly modify only the direction of motion, without being able to alter its amount.

The fact that the pineal gland is also found in the brains of animals, a circumstance which might have

⁶ *Princ. Phil.*, IV; *Dioptr.*, IV; *Passions de l'âme*, I.

⁷ The doctrine of animal spirits, though often employed as part of a purely physiological hypothesis, as in Hobbes (*De Corpore*, c. 25), goes back to the Stoic pneuma doctrine, and is widely employed until well into the eighteenth century. It is found in Origen, St. Augustine, St. Thomas, Telesio, Nicolaus Cusanus, Paracelsus, Francis Bacon, Hobbes, Spinoza, Malebranche, the poet Schiller, and many others. See Siebeck, *op. cit.*, I, 2, 265 ff.; Rudolf Eisler, *Wörterbuch d. phil. Begriffe*, I.

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given pause to a less intrepid doctrinaire than Descartes, is dealt with by the statement that, although the pineal gland in animals also has a regulating function, physical stimuli alone suffice to bring about bodily changes.⁸ To the question as to how the soul can change the direction of motion, or how the movements of mass particles can produce disturbances of the soul (*perturbationes animi*), Descartes does not offer an adequate answer. The fact that it seems hardly to have occurred to modern interactionist writers to raise the question is evidence that their interest is primarily to prove the influence of the soul upon the body (not the reverse), and thus to vindicate man's importance in the universe. Descartes somewhere tells us that he refrained from publishing his views on ethical questions because the establishment of moral laws is a matter for those in power and princes. One wonders why the psychophysical problem was not also left to the same august authorities, since the ultimate results could not have been very dissimilar to those reached by Descartes.

Descartes' ethical teachings are, as a fact, based upon the psychophysical views already elucidated, and merely reproduce, in their broad features, familiar Platonic and Stoic ideas. The soul is passive (as in perception and emotion), in so far as it suffers disturbances through its contact with the body. Its task, accordingly, is to free itself from the domination of matter by the attainment of clear and distinct ideas. This type of intellectualist ethics was developed with incomparable grandeur by Spinoza, according to whom the mastery

⁸ Cf. Hoffmann, *Descartes*, p. 181.

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over the emotional disturbances incident to the bodily life was possible only through their intellectual apprehension.⁹

DESCARTES, *Collected works*, ed. V. Cousin; complete French ed. of collected works in Romance Library, 1904 ff.; English translation by Haldane and Ross. See studies of Descartes by Mahaffy and by Haldane; Bouillier, *Histoire de la philosophie cartésienne*; N. K. Smith, *Studies in Cartesian Philosophy*; B. de Saint-Germain, *Descartes considéré comme physiologiste et comme médecin*; A. Koch, *Die Psychologie Descartes*; Natorp, *Descartes Erkenntnistheorie*; Duboux, *La Physique de Descartes*; Foster, *History of Physiology during the 16th, 17th, and 18th centuries*. On the theory of animal automatism, see also T. H. Huxley's Belfast address, "Animal Automatism."

⁹ *Ethics*, IV, V.

Materialistic Developments

Gassendi, Hobbes, and Borelli

DESCARTES' mind-body theories and his views on animal psychology were opposed from two directions, first, by men like Gassendi (1592-1655) and Hobbes (1588-1679), who sought to develop a purely materialistic conception of nature; secondly, by men like Condillac in the eighteenth century (1715-1780), who, following Plutarch and Montaigne, minimized the alleged differences between man and the animals, and ascribed to the intelligence of animals sundry activities which were viewed by Descartes and his followers as having a purely reflex and instinctive character. Condillac is also notable for definitely raising the question of the evolution of animal intelligence, which he answered in an empirical sense.

Descartes' mechanical conceptions were carried forward on the physiological side by Borelli and Willis, and on the side of animal psychology by Reimarus who, in sharp contrast to Condillac, viewed animal activities as predominantly the expression of definite inborn propensities (instincts), and as among the most extraordinary examples of the general teleology of nature. We turn first to the naturalistic developments of Descartes' ideas in Gassendi, Hobbes, and Borelli in metaphysics and physiology, reserving the treatment of the effects of the Cartesian discussions upon the more specific questions of animal psychology for a separate chapter.

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To attribute to Gassendi the merit of having solved the mind-body problem which Descartes had left in a very unsatisfactory state would be an exaggeration. Gassendi's main importance lies in his revival of Epicurean atomism, and in his attempt to develop the mechanical conception of nature which Descartes had failed to carry through with logical consistency. He contents himself, however, in the main, with a repetition of the familiar doctrines of ancient atomism, without adding anything of essential significance.

Matter is the sole reality. It is ingenerable and indestructible. It is composed of ultimate units called atoms, which differ from each other only in size and form. They are solid and mobile. Their motion is an intrinsic and inalienable property, so-called rest being only an interruption of motion. Further, Gassendi recognized empty space, motion being defined as the translocation of atoms in space. In agreement with Descartes, and anticipating Newton, Gassendi denies action at a distance (*actio in distans*), physical gravitation, the action of the magnet, and even human inclination, as when a child is attracted by an apple, being attributed to some sort of mechanical intermediation.

How sensation can result from the play of material atoms Gassendi admits to be an insoluble problem. However, he recognizes, in addition to a material soul of atomic structure, whose function is sense perception, an immaterial, rational, and immortal spirit. These parts of Gassendi's psychology are, however, so extraneous to his system as a whole that they may safely be

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viewed as merely a concession to theological orthodoxy, and consequently disregarded.

A further step toward the abandonment of the dualistic position, and the development of a purely mechanical conception of organic life remarkably similar to modern behaviorism and tropistic conceptions was taken by Thomas Hobbes (1588-1679), in whom the doctrines of materialistic monism received their final formulation.

The only realities are bodies and motion. The motion of a body is always due to a previous motion. Spirit is sometimes defined as a body too refined to be perceived by the senses, sometimes as a motion of certain parts of the organism. Sensation and perception are merely movements within the organism. Sensation is due to a physical impression upon the sense organ which is transmitted to the brain and thence to the heart.¹ The principle that every action is followed by a reaction applies to organisms as well as to physical bodies. The reaction from the heart results in sensation and motion. Memory is defined as the continuation of a previous sense impression (*sentire se sensisse est memoria*). The association of ideas is also explained in a purely mechanical manner.

The difference between man and the animals is merely one of degree. Man's only advantage over them lies in his capacity for general ideas, and in his possession of the conventional signs of general ideas, called language. The wise man sees in words only convenient counters; for the fool they are gold (nominalism).

¹ *De Corp.*, IV, 25.

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In addition to the reaction called sensation, the organism reacts with feelings of pleasure and pain, the former when the incoming impression is beneficial, the latter when it is hurtful to the organism. When related to future states, pleasure and pain become desire and aversion. Freedom cannot be attributed to the will, but only to action. An act is free when it is performed in the absence of compulsion, i.e., when it is the outcome of the organic tendencies of the individual, unimpeded by outside forces. The outward activity of the organism is the precise and inevitable outcome of previous motions, including those of the nervous system.

The resemblance both in point of view and results between the formulations of Hobbes and the modern behavioristic and tropistic positions is too obvious to require discussion. Hobbes, to be sure, continues to employ terms referring to psychic processes of various sorts, so that we have in Hobbes a type of materialistic psychology not unlike that of most of the current psychology text-books of today. The only thing necessary to the most extreme requirements of modern behaviorism was to eliminate all reference to psychological factors, and to express the behavior of the organism entirely in terms of physico-chemical activities. An important step in this direction was made by Hobbes' contemporary, the Italian mathematician and physicist, Borelli.

Giovanni Alphonso Borelli (1608-1679), the discoverer of the principle of capillarity, was the author, among other important works on physics and astronomy, of a treatise on *The Motion of Animals*,² in

² *De Motu Animalium*, Leyden, 1680-1681.

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which he elaborates a theory of neuro-muscular activity along purely mechanical lines.

Basing his theories upon the discovery of the Dutch physicist Steno that muscular tissue was composed of parallel fibres connected by cross fibres, thus rendering them distensible by the lateral action among the longitudinal fibres, Borelli advances the view that in the impulse to movement a subtle substance from the nervous system enters the muscle, and there encounters another substance, with the result that by a process of fermentation minute bodies are formed between the muscular fibres, forcing them apart, and thus producing muscular contraction.

The function of the glands was also to be understood on purely mechanical principles, as merely a process of filtration, certain particles constituting the various fluids being separated from others (as venous blood and urine), by the varying calibre of the pores of the glandular walls and tissues.

GASSENDI, *Opera*, 2d ed., 1770. See Lange, *History of Materialism*, I, 3, Ch. 3; Kiefl, *P. Gassendis Erkenntnistheorie und seine Stellung zum Materialismus*; Damiron, *Mémoires pour servir à l'histoire de philosophie au XVIIe siècle*; G. S. Brett, *Philosophy of Gassendi*; Hobbes, complete ed. of works, English and Latin, by Molesworth. See monographs on Hobbes by Robertson, L. Stephen; Lyon, *La philosophie de Hobbes*; F. Tönnies, *Hobbes Leben und Lehre*; A. E. Taylor, *Thomas Hobbes*; Brandt, *Thomas Hobbes*. Borelli, *De motu animalium*, Rome, 1680-1681; Eng. trans., *The Flight of Birds*, 1911.

Empiricist and Nativist Controversies of the Eighteenth Century

Condillac and Reimarus

THE great names of Leonardo, Francis Bacon, Descartes, Gassendi, and Hobbes mark the seventeenth century as a period in which mechanical conceptions of nature gain a definite ascendancy over Aristotelian and vitalistic tendencies which had held almost undisputed sway throughout the Middle Ages. In the eighteenth century biological and humanistic points of view and interests come increasingly to the fore. In comparative psychology they manifest themselves mainly in two tendencies, one materialistic and free-thinking (Condillac), whose ostensible aim was to minimize the differences between man and the lower animals, a cardinal point in the ecclesiastical philosophy of the Middle Ages, by attributing to animals a mentality akin to that of man; the other tendency (free-thinking, too, but religious, as opposed to French materialism), an idealistic and teleological popular philosophy, growing out of the philosophy of Leibniz and Wolff, and usually referred to as the Enlightenment. The most influential names here are Reimarus, the celebrated author of the *Apolo-gie oder Schutzschrift für die vernünftigen Verehrer Gottes*, Moses Mendelssohn, Nicolai, Garve, Tetens, Lessing, and the "Prince of the Enlightenment," Frederick the Great, who combined in himself in a remark-

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able manner the contemporary free-thinking tendencies of both French and German thought.

Although the objective of the Enlightenment was often nothing less than the proof of design throughout the whole realm of the natural universe, the purposive arrangements of organic nature came to be viewed as among the crowning evidences of the existence and wisdom of the creator, and the study of adaptation, under the pressure of theological motives, assumes an extraordinary vogue, making the period as a whole, to the modern empiricist and non-theological temper, one of the dreariest and most unproductive in the whole history of philosophy.

I

Condillac (1715-1780) develops his views of human and animal psychology in two major works, the *Traité des sensations* (1754) and *Traité des animaux* (1755), a brief work comprising sixteen short chapters, and scarcely two hundred pages.

Condillac's starting point is the empiricism of John Locke, according to whom the whole of the mental life is the product of sense experience. Condillac, indeed, carries the Lockian sensualism one step further in excluding "reflection" as an independent source of knowledge, thus leaving external sense perception as the only avenue of the mind. "Le moi de chaque homme n'est que la collection des sensations," the soul is merely the sum of sensations: with this formula Condillac disposes of the notion of innate ideas and of congenital instincts as well. Condillac illustrates his position by the cele-

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brated marble statue possessed, we are to suppose, of a soul, but deprived of the various sense organs, and hence wholly unconscious, until the senses are one by one supplied, thus furnishing the soul the necessary material for consciousness and knowledge.

The more complicated mental functions are merely *sensation transformée*, results or transformations of sense perception. Memory is possible in virtue of the fact that sensation survives the moment of the original impression on the brain. The comparison of sense impressions involves judgment. Ideas are sense impressions surviving in memory. The memory of a pleasant impression gives rise to desire and will. Thus both knowledge and the moral will emerge out of an original matrix of sense experience.

The facts of the mental life, however, compel Condillac to reject materialism in favor of a substantial soul not unlike that of Locke and the other empiricists of the time. Matter, as extended and divisible, remains a mere aggregate. The coalescence of sensations into a unified mental life presupposes a unitary subject. It is accordingly not the sense organs that perceive, but the soul, which organizes out of an original multiplicity of sensations its various experiences and functions.

The conception of a substantial soul is carried over into animal psychology where we may suspect it is defended with special zest, since Condillac had set himself up as the defender of *les bêtes* against their scholastic detractors. Animals have souls, as well as men. They are capable of sense perception, ideas, memory, judgment, and even language. Their lower

status is merely due to the greater paucity of experience, which in turn is accounted for by their inferior bodily equipment, especially in sense organs, much as an individual human being might be supposed to possess a superior mentality, which, however, remains undeveloped owing to defective stimulation and experience.

Through the interaction of the two factors of external sense impression and internal need, the whole round of animal activity is gradually elaborated. The main stages in the animal's progress from helplessness to mental maturity appear to our author to be simple and obvious. The animal is subjected to sense impressions which are felt by it as either pleasurable or painful. As a consequence, the animal performs its first movements, which at the outset are made gropingly and in an uncertain manner, and without participation on the part of consciousness. With a recurrence of impressions and needs, the animal repeats its previous movements, but now with less uncertainty and hesitation, and so on, until at length a routine of movement and of judgment is definitely established.

The description, as is evident, is merely a somewhat general statement of what is today called trial and error learning, except that the initial equipment of reflex and instinctive apparatus, usually assumed by present-day writers, is reduced to a minimum of organic need (*besoin*). If Condillac's theory is expanded so as to provide for the preservation, through heredity, and the gradual consolidation of the acquirements of the individual animal, with the result that its offspring start with a native stock of tendencies and facilities, we have in its

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main outline the theory of animal psychology upon which Lamarck's fame later became established.

II

The existence of such a native stock of dispositions and facilities (minus the geneticist features of later evolutionist theory) was defended against Condillac by Hermann Samuel Reimarus¹ (1694-1768), an enemy of religious orthodoxy, on the one hand, and of French materialism, on the other, whose interest in the matter, as said, was primarily in proving the existence of teleology in the natural world, and thus defending a religious interpretation of nature, as against the materialistic tendencies of the French Enlightenment as represented by Buffon, de La Mettrie, and their school.

If the extraordinary adaptations of animals called instincts were indeed accomplished without intelligence, as scholasticism and Descartes had maintained, they were clearly among the most remarkable instances of teleology in nature, which Reimarus did not fail to exploit in his search for "rational" proofs of a creator, much as modern vitalism sees in the phenomena of organic regulation proofs of some non-physical agent responsible for processes like growth, restitution, co-ordinated muscular actions, and the like.

It is an unfortunate circumstance that the theological cast of Reimarus' speculations, and his schoolmasterly

¹ Born at Hamburg, and educated at Jena, Reimarus became *Privat-docent* in philosophy at Wittenberg, travelled in Holland and England, becoming professor of Hebrew and philosophy at the Johanneum at Hamburg, in 1728.

manner, caused his works to be almost completely neglected since his day. As we shall see in the sequel, Reimarus not only anticipated much of the *Naturphilosophie* of post-Kantian philosophy in Germany, as in Fichte, Schelling, and Schopenhauer, but forecast one of the most influential trends in modern biological psychology, which sees in instinct a non-acquired character (anti-Lamarckian). Finally, Reimarus offers an elaborate classification and analysis of the native tendencies, with many shrewd observations on the psychological accompaniments of instinct, the delayed and seasonal appearance of the instincts, their modification during the life history of the individual, and numerous other aspects of animal behavior, buttressing his theories with a mass of evidence from the animal lore of ancient and modern writers, and from his own observations in every department of animal life. Indeed, the only essential difference between Reimarus and modern theories of instinct is that the theory of divine origin takes the place, in Reimarus, of the geneticist and natural selection theories in vogue since Darwin's day. While the estimate of Groos² that we have in Reimarus' work a model of critical investigation which will stand for all time is doubtless an exaggeration, his investigation of instinct will always maintain a high place among the earlier modern works on animal psychology.

The two works of Reimarus which are of interest for our present purpose are *Die vornehmsten Wahrheiten der natürlichen Religion*, a book of some eight hundred pages, first published in Hamburg in 1754, and his

² See *Die Spiele der Tiere*, p. 37.

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Allgemeine Betrachtungen über die Triebe der Tiere, hauptsächlich über ihre Kunsttriebe, a book of about five hundred pages, the first edition of which was printed in Hamburg eight years after the earlier work, in 1762. Both books passed through several editions, the latter being also translated into Dutch (1761) and French (1770). The references in what follows are to the fourth revised edition of the *Vornehmsten Wahrheiten*, and to the third edition of the *Triebe der Tiere*. We proceed to a brief exposition of the relevant ideas of the earlier volume.

After labored "proofs" (they are little more than assertions), familiar in the period of the Enlightenment, that the whole meaning of nature is to be found in its utility to living creatures (*dem Nutzen der Lebendigen*), and that nothing illustrates the beneficent design of the creator more clearly than the instincts and arts of the irrational animals, Reimarus proceeds to the development of the following positions.

There is a gradual advance from the lowest animals to man, the highest animals not being far removed from man in sense perception and intelligence. Although not endowed with reason, the animals have this deficiency more than made good through the wisdom of the creator by the possession of certain inborn natural impulses and instincts, by means of which they are able to accomplish perfectly, and without reflection, experience or practice, acts which the most perfect reasoning powers could not improve upon.

The ends subserved by the instincts are nutrition, self-preservation, self-defence, and propagation of the

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species. Every creature knows its element, whether air, water, or earth, and its own bodily structure, so well as to be able to move about perfectly, although the manner of locomotion differs greatly among different animals. It discriminates without difficulty between substances which serve as food and those which are harmful. Some animals even know the medicinal value of substances, which they use in illness or injury. In case their food is not ready at hand, they are provided with instincts for foraging, for the pursuit of prey, and for collecting and hoarding food for the winter. Some animals migrate to distant lands, to which they know their way without chart or compass; others that need no food for the winter hibernate through the cold season by burying themselves beneath the ground or water. They either find ready-made or construct artificial shelter of a great variety of types.

The wisdom of the creator has also provided for the maintenance of a numerical proportion among the various species of animals through their mutual extermination up to certain well-defined limits set for them. For this purpose they employ the weapons provided them by nature, over the use of which they have perfect control, or else they avoid combat and escape from each other through cunning and speed. If they do not succeed in these objects by acting alone, they unite for coöperative action. They follow a leader, communicate by a common language, each member of the community doing its part in accordance with unchanging laws.

In the pairing season they know their proper mates, perform the sex functions, prepare nests, hatch, feed,

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wean, warm, and protect their young. If eggs do not require hatching by the mother, they are laid where they will be hatched by natural warmth, and in the proximity of food and shelter. They are laid singly or together, according as the creature in question is solitary or social in habit.

That such activities as described can be performed by machines, as Descartes and the materialists maintain, or that they take place through a preëstablished harmony (Leibniz), seems wholly incredible. A machine which rests, creeps, walks, flies, leaps, and swims, and never at random, but in such a way as to preserve itself, a machine which feeds on what is necessary for its maintenance, which spins, weaves, digs, builds, collects food, mates, bears, feeds, and protects its young, and thus produces and maintains machines like itself, such a machine, if it were possible, would not be self-sufficient and self-explanatory. It would presuppose the intermediation of ideas and forethought, and the existence of an infinitely wise creator who knew the interrelations of all things in their entirety, and who had secured the mutual adaptation of forces to infinity.

The suggestion that the activities of animals are determined by the structure of their bodily organs Reimarus answers by the statement that bodily organization merely furnishes the possibility of characteristic movements, as in the marionet; the power to use the organs advantageously is nothing physical, but is the work of intelligence, the master of mechanism. The young buck or bull, moreover, butts before he has horns,

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proving that he knows the use of organs before he has the organs themselves.

Nor can animal activities be understood as merely mechanical reactions to sense stimuli (Condillac and Buffon). Sense impressions may be pleasurable or painful, and may produce restlessness and an impulse to appropriate or avoid the stimulus, but the particular form the reaction is to take is not determined by the sense impression, nor is any adequate suggestion, example, or model for the creature to imitate contained in its previous experiences.

To suppose that the activities in question are the result of reasoning in the animal is to exceed the realm of probability. If animals were able to perform the various activities of which they are capable by invention or reasoning, their intelligence must greatly surpass man's; for animals can perform feats immediately after birth far greater than mankind has been able to attain to after thousands of years of united effort. Furthermore, if the actions in question were reasoned, they would vary according to the creature's capacity and circumstances. But birds build their nests now as they did in the beginning; the bee hive of Europe is constructed, and its life is governed, on the same principles as in Asia. The instincts of animals neither improve nor decline, but remain stationary within the limits of perfection established by nature.

With the exception of the suckling activity of the human infant, man has few if any instincts. Our muscular facilities like reading, singing, playing an instrument, and the like, are gradually acquired through at-

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tention, reflection, and ideas. Once acquired, they are performed with a minimum of attention and effort. Such skills, so tediously won by man, animals possess at birth. If animals were not born with instincts, they could not have survived to maturity, for the life span of many animals is too brief to bring them the requisite experiences, even if they had the power to profit from them.

In Book VII, Reimarus attempts to set forth in a more systematic manner both the resemblances and differences between man and the animals. The greatest similarity, he finds (the point would seem highly questionable today), is to be found in sense perception. In addition, the animals resemble man in the possession of representation (*Einbildungskraft*) and memory. Both feel pleasure and pain and the consequent impulses of sensuous desire and aversion. Reimarus even concedes the existence, which he is usually inclined to minimize, of a short list of human instincts, viz., nutrition, mating, and the feeding and defence of offspring (p. 532). But man's experiences, whether of present or past, are felt with a peculiar distinctness (*äussern sich mit einem deutlichen Bewusstsein*), owing to the fact that they are conceptualized and expressed through the medium of an articulate language.

In addition to the mental functions he has in common with the animals, man also possesses reason, free will, and the capacity for moral advance. Freedom of action is secured through the influence of the soul over the body, which Reimarus (like Descartes) seems to envisage in such a way as to involve the least possible out-

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put of energy, "as the steersman turns the great ship in any desired direction by a small action upon the steering mechanism."

The soul, Reimarus urges against de La Mettrie and the materialists (p. 477), is a unitary substance, extended, and indecomposable, and thus differs wholly from the body, to which it stands in the relation of mutual dependence and interaction (VI, §§ 7, 9, 10, and elsewhere). The soul could not perform its functions if it were not for the bodily sense organs and motor apparatus. On the other hand, the most healthy and perfect body without a soul would be nothing but a lifeless mechanism. It might have the clearest eye and yet not see, the sharpest ear and not hear, the most sensitive nerves and not feel, the most shapely hands and feet and be unable to use them, the most perfect brain and be unable either to think, or will, or resolve. But once the soul is added, it uses and controls all these instruments to accomplish increasingly its own desires and purposes.

In virtue of the possession of reason, man not only makes up for the lack of instinct, but is able to curb the sensuous desires, and to supplement the pleasures derived from sense by various rational satisfactions in the enjoyment of order and proportion, in the pursuit of truth and the recognition of beauty and fitness in nature and in art. Man's happiness is thus not to be found merely in sensuous satisfactions, which are transitory, but in a life of rational activity and virtue, commensurate with his higher intellectual and moral powers. Although beginning life with no original capital of

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knowledge and skill, he is able, through the unlimited capacity of his reason, to make endless progress in knowledge and power, while the animal is confined within the definite limits of his original capacity (VII, § 16). With this high flight, so characteristic of the age of the Enlightenment, Reimarus concludes the considerations of his first volume.

III

The main interest in the later and better known *Die Triebe der Tiere*, lies in the full and, for the time in which Reimarus was writing, extraordinarily close description of the conscious processes in animals, which he treats under the caption of "Vorstellungstriebe," and in the attempted classification and description of the "Kunsttriebe," or instincts proper. As regards the latter, Reimarus re-states the positions already defended at much length in his earlier treatise, that they are not the product of experience or reason, but inborn capacities, by the use of which, without the employment of reflection or intelligence, the perpetuation of the individual and species is secured. In contrast to the predetermined character of animal activities and functions, man's endowment is little more than a number of undetermined possibilities, so that, partly driven by his native helplessness, partly incited by his nobler emotional susceptibilities, he is capable of an endless progress in knowledge and in skill, in moral perfection and happiness.

Animals are distinguished from the rest of creation (1) by the possession of sensation, which Reimarus

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defines as the consciousness of things present to the senses, even though indistinct; and (2) by voluntary movement. Since sensation is the function of the soul, it is necessary to concede to animals the possession of a soul, which uses the bodily organism as its instrument.

The relation between body and soul, experience shows, is intimate and mutual, for (a) the very existence of a conscious life presupposes the functioning of the physiological mechanism; (b) the sensations are conveyed to the mind through the sense organs; and (c) the inclination or aversion felt as a consequence of sense experience can be expressed only through the muscular apparatus. The ultimate nature of the relation between body and mind, however, remains a mystery (I, 1).

The term *Trieb*, impulse or conation, is used by Reimarus in the widest sense to stand for any kind of tendency or activity, either bodily or mental. Thus understood, he divides all the tendencies into three classes: (1) Automatic tendencies (*mechanische Triebe*), by which he means intra-organic and reflex processes such as the reaction of plants to contact or light, circulation, digestion, glandular action, the contraction of the iris, and the like; (2) *Vorstellungstriebe*, activities of consciousness, or the tendency to become aware of objects; and (3) *willkürliche Triebe*, overt bodily activities or conations aimed at the appropriation of the pleasant and the avoidance of the unpleasant.

The voluntary activities (*willkürliche Triebe*) are in turn subdivided into (a) *Affectentriebe*, affect impulses, comparatively simple responses set off by sensuous

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desire or aversion, like feeding or withdrawal from a painful stimulus, and (b) *Kunsttriebe*, impulses of construction, which imply some degree of art or skill, like nest building or weaving.³ The author does not adhere to this last division strictly, and comes to call all congenital overt activities by the name of *Kunsttriebe*, or instincts, much as in the modern usage. We shall return to the discussion of the impulses of construction presently, after sketching the views of Reimarus of the other types of response just enumerated.

The three classes of tendencies named above are by no means independent of each other, but are intimately related. Even the automatic or purely machine-like bodily processes are often influenced in an unmistakable manner by sensations, ideas, or emotional states, although these may be present in only a faint degree. So respiration, yawning, the flow of saliva, heart action, the sex functions, and the like, are frequently stimulated and modified by psychic conditions, and important bodily functions may be interfered with or even completely arrested by violent psychic disturbances. While, therefore, the bodily functions are not in every detail activated by psychic causes, as some hold, it is also evident that a living organism is not a mere mechanism, on a par with man-made machines (I, 6).

The automatic bodily functions are merely conditions, but they are indispensable conditions, of consciousness. Unless heart and lungs performed their functions, the sense organs would fail to register impres-

³ Darwin's term "architectural instincts" (*Origin of Species*) for this class of activities is to be recommended.

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sions, and the entire conscious and volitional life would instantly cease. Even as mechanical processes the intra-organic functions must ultimately be viewed as the results of intelligence, since they exemplify form and regulation. The Stoics were right in recognizing the mechanical arrangements of nature as artful; they were in error in thinking these arts as self-taught (*αὐτοδίδακτος*), as was Hippocrates when he spoke of nature as being inventive without insight or reflection (*οὐκ ἐκ διανοίης*). A self-taught and self-invented machine is unthinkable.

The second class of activities considered is the mental (*Vorstellungstriebe*), conscious activities. An interesting modern feature of Reimarus' psychology is the voluntaristic trend, which, in spite of being masked by his old-fashioned terminology, is unmistakable throughout. The psychic processes, it will be observed, are classed as conations along with the automatic bodily activities and the overt, voluntary activities, as the term *Vorstellungstrieb* clearly indicates. Consciousness is described as a natural exertion or bent of the soul (*ein natürliches Bemühen der Seele*) to form a clear idea of what is presented to sense perception, to attend, remember, think, etc. (II, 11 ff.).

The conscious processes which Reimarus attributes to animals are sensation, attention, representation, association and memory, and indistinct ideas. It will be impossible here to give a detailed account of Reimarus' discussion of these various functions. Even a cursory reading of his pages will show that he grasped and

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stated many of the distinctions familiar from the psychology text-books of today.

In attention, the field of consciousness divides into a clearer, focal portion, and a relatively indistinct out-field or margin. The focalization of consciousness is due either (a) to the intensity of the stimulus (a pistol shot), or (b) to its hedonic value, its pleasantness or unpleasantness (a work of art); in the former case attention is involuntary, in the latter voluntary. The adaptation of their sense organs and other bodily adjustments shows that the animals have the power of focalizing attention, and even of giving voluntary attention. The biological importance of the limitation of the conscious field is also deftly sketched (II, 13).

In animals, as in man, past experience is revived as a result of present sense impressions, with which the memory images are indistinguishably mingled. Association in animals is involuntary and probably merely perceptual, i.e., radiating out from a perceptual starting point, instead of from previous ideas. Whether animals have the power of voluntary and purely ideational association is for Reimarus very doubtful (II, 14). The case of animal dreaming seems to strike him as a possible exception, but he contents himself with merely hinting at the probable resemblance between the animal dream and the fantastic combinations of the human imagination. In both, past experience is felt as present, and the associational course of imagery is comparatively uncontrolled and illicit. The differences in degree and type of control, a highly interesting topic, Reimarus does not work out.

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In general, the ability to recognize the past as past is absent in animals, as is also the ability to discriminate ideas sharply from each other. They have a confused representation of things in which the present sense impression combines with past experience to form a comparatively distinctionless mass. With no power to hold apart its experiences or to grasp general notions, the faculty of judgment, which presupposes the existence of clearly distinguished concepts which are compared with each other, is also wanting. A man says, the trees are turning green; for the animal tree and green, and other elements from its past experience, coalesce into a single vague sense perception.

Still less can an animal form an inference, since this involves the comparison of two concepts by means of a third. The power to discern hidden relationships, the true test of reasoning, is not found in animals. The absence of an articulate language is a mere result of the inability to form general ideas, not a cause of it. The distinction between man and the animals is thus not one of degree, but of kind. Children show powers of reasoning at a very early age, but animals do not even possess a low degree of such a power. What often misleads is that through their obscure perceptions and their instincts they are able to adjust themselves to their surroundings and satisfy their needs as effectively as man with his superior power of reflection and reason. The function of the animal and the human powers is the same. Although shut out from the realm of abstract knowledge and science, the animal makes the adjustments necessary for it. It lives.

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The third class of conations is the class of voluntary activities (*willkürliche Triebe*), the discussion of which forms the principal task of Reimarus' volume. By voluntary activities Reimarus does not mean, he explains, tendencies preceded by distinct ideas of alternative actions; they are not, on the other hand, merely mechanical or bodily reactions. They consist in an inclination or disinclination of the will, due to a preceding sensation or representation, perhaps indistinct, of pleasure or pain, and resulting in actions in conformity with the bent of the will (III, 32). In the nutritive impulse, for example, three features are clearly distinguishable: (a) The sensation of hunger, (b) the impulse to eat, and (c) the action of eating itself. In some activities, like walking, talking, playing a musical instrument, etc., the affective element which activates the impulse is the pleasure felt in the exercise of the function itself (III, 32).

To understand how the initial sense impression can produce the activities concerned, one has to suppose the existence of an hereditary mechanism of sense organs and of bodily and nervous structure sensitive to the different forms of sensory stimulation like contact, temperature, vision, odor, taste, and the like. The variety of response made by different animals to the same stimulus is merely due to different types of bodily organization, sensory acuity and the consequent range of the sense organs also playing an important part.

In the lower animals this native equipment of bodily mechanism is often far more perfect than in man, thus enabling them to sense the feeling value of sense im-

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pressions, and to adapt themselves to the conditions of life by relying exclusively upon instinct, while man has to supplement his inadequate and undependable natural impulses by the employment of the higher faculties of judgment and reason (III, 33).

In the determination of animal actions, the memories of previous pleasures and pains often combine with present experience, the two, present and past, sometimes reënforcing, sometimes opposing each other. In the latter case, the animal may seem to exercise free choice, but this appearance of freedom is deceptive, since the strongest stimulus, accompanied by indistinct representations, invariably becomes effective, while man's choice is rational, i.e., made with a clear insight into the advantage or disadvantage (good or evil) of the act (III, 34).

The natural instincts often undergo modification through domestication and training, making it important to distinguish between the original form of an instinct, and its later, more or less artificial reorganizations (*natürliche* and *abartende Triebe*). The modifications wrought in the natural instincts through human intervention might be looked upon as human art grafted upon the wild stem of the animal's native capacity. Such modifications are made primarily for the benefit of man.

All the special instincts are variations of the fundamental impulse of self-preservation (the *πρώτη ὁρμή* or *primus impetus* of the Stoics and Cicero), which includes the care of offspring, an extension merely, in Reimarus' view, of the self-regarding im-

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pulse. The reproductive or parental impulse offers Reimarus a capital opportunity to demonstrate once more the native character of instinct. An animal's own condition, its weal or woe, is a matter of immediate feeling, to which it cannot well remain indifferent. But how is the animal apprised of the condition of its offspring, and why does the self-regarding impulse extend itself beyond the boundaries of the individual to the progeny? One might surmise that in the case of animals that suckle their young an attachment for the young might develop through the fact that the young relieve the distress of the mother animal by emptying her udder. But how does this explain the care bestowed by animals upon their eggs? Nor can the parental attachment to their young be explained by the physical resemblance between the parents and their brood, since in the case of eggs no resemblance exists. Furthermore, birds prepare nests for their eggs in advance, so that all explanations which set out from the sense experience of the animal, or from the pleasure and pain associated therewith, entirely fail. It is clear that we must abandon all such empirical hypotheses, and suppose instead the existence of a pre-determined, inner tendency or bent in a certain direction, without the animal's being distinctly aware either of the result of the activity, or of the means requisite to reach it.

In the case of the pairing impulse, the sensuous pleasure from the actual sex contact might be supposed to evoke and sustain the activity in question; in the care of offspring, however, the amount of bodily pleasure

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derived from the activity is so slight as to shed no light on the matter, particularly since the means adopted are often very artificial and indirect, and cannot therefore be supposed to have any derivative emotional value. Neither the preparatory nor the consummatory stages of the instinctive activity are therefore subject to any kind of conscious guidance or rational control. Nevertheless, experience teaches that the exercise of any natural function is attended by pleasure; hence we may suppose that instinctive activity is pleasurable, although it is not explained by any antecedent pleasure or representation, which does not in fact exist (III, 41).

From the master instinct of self-preservation are derived the various special instincts, which are merely differentiations or forms of the more general tendency. The special instincts divide again into two classes, as indicated above, (1) those which are activated by an affect (pleasure or pain), and which we may call the affect-impulses (*Affectentriebe*), and (2) those which involve art or skill, and which we may call the instincts of construction (*Kunsttriebe*). Examples of the former would be the feeding and mating activities; of the latter, the spinning, weaving, and nest building activities of insects and birds. The affect-impulses man has in common with the animals, although the animal's impulses, since they are preceded only by indistinct representations, remain below the human level of freedom and morality. In the case of the constructive instincts, the difference between men and animals is noteworthy, for while man invents or otherwise ac-

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quires his skill or facility, the animals possess it at birth.⁴

In the discussion of the affect-impulses, Reimarus insists upon the rôle of antecedent or accompanying pleasure and pain in the activation of the impulses. It is impossible to understand how an animal or man could perform any act such as self-protection, caring for young, feeding, or mating, if it were not for the actual or anticipated pleasure or pain in the action concerned. An obvious answer to this might be, as Reimarus has himself elsewhere hinted, that the action is due to an hereditary mechanism, as we should say nowadays, which is set in motion by external stimulation. The fact, of course, that the painful results of any instinctive activity tends to bring it to a standstill, would seem to show that the pleasure-pain experience stands in a causal relation to the instinctive activity. But Reimarus does not follow out these points.

In man, of course, sense impressions, pleasure and pain, and the instincts, are not the sole determinants of action. They are merely what the wind and waves are to the sailor, without which he could indeed make no progress, but which he masters through the management of sails and rudder. To say, as some do, that the instincts and feelings are God-given, and must hence

⁴ Psychologists today often list an instinct of construction as one of the human instincts, or inborn propensities. Nevertheless, Reimarus' point is probably well taken. Animals, like insects and birds, not only have an inborn impulse to construct, but the executive skill involved in the activity seems not to be learned, as is the case with man, but is a part of the native equipment. Still, the difference may be merely one of degree, and it might be maintained that there are inborn differences among human beings as regards facility, as well as in the drive itself.

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be obeyed, is like saying that the wind and the weather are God-given, and that the sailor must go where they carry him. The animals have only indistinct representations and sense impulses, and are incapable of understanding the meaning of law or of good. But man is crowned with reason and freedom, and hence feels moral obligation and duty. Animals are as successful as they are (1) because they are capable only of sensuous satisfactions; (2) because their perceptions are more acute than ours, hence affording them guidance where we should fail without the aid of reason; and (3) because their inborn instincts prompt them to actions for which feeling alone would not suffice.

It is in the instincts of construction, however, that we see one of the clearest distinctions between animals and man. The impulse to do a thing and the power to do it are two different things, and the former does not necessarily imply the latter. The instinct of self-preservation, for example, as shown in the impulse to avoid danger or cold (mere affect-impulses, so far), does not by itself enable the animals to construct artificial shelter or covering for themselves. The latter requires a certain dexterity (*Geschicklichkeit*) which is gradually acquired by man, but exists in animals at birth. So also the desire for warm covering or for food does not by itself enable a man to weave a blanket or a net, but merely prompts him to invent gradually and in time the arts of the weaver or the fowler.

Not so with the animals, which inherit these arts as their birthright. So the moth weaves its cocoon, the spider spins its web, the bird builds its nest, the bee its

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honeycomb. These activities show the two principal marks of inborn propensities: (a) They do not presuppose any experience or period of training, as is shown by the fact that they are performed perfectly the first time, and (b) they are performed uniformly and according to set rules by all the individuals of a species, although a great diversity of other methods are theoretically possible. Finally, it cannot be supposed that purpose or invention has any part in the activities concerned, although the adaptation of means to ends is such as the most acute intelligence might have contrived. Such activities we call instincts.

In an interesting note Reimarus defends the use of the term instinct against the critics in his day who, it appears, anticipated present-day critics, who also inveigh against the term instinct as an unmeaning conception. Thus an anonymous writer in the *Hamburger Magazin* holds that inborn instinct is a notion devoid of meaning, and one Guer, in his *Histoire critique de l'âme des bêtes* (1749), writes that "l'Instinct est une espèce d'enfant trouvé; c'est un sentiment purement populaire; c'est le sentiment des ignorans, des gens qui n'ont aucune teinture, aucun principe de Philosophie"; and, in another place, "de là un Raisonneur conclut hardiment, que dans les bêtes, comme dans les hommes, l'Instinct est une chimère; que c'est un principe obscur, inconnu, inintelligible, un être de raison, un mot vuide de sens, qui n'a pas plus de réalite qu'un bâton sans deux bouts, ou une montagne sans vallée."

There is an evident confusion here between two questions which must be carefully distinguished. One is

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whether a term stands for something actually existing, or a self-contradiction, a mere nothing, which cannot even be thought. The other is, whether the term gives a clue to the genesis, or offers an explanation of, the thing referred to. The critics of instinct seem to argue that since the term instinct does not elucidate the manner of the origin, or the explanation, of the animal activities in question, it is therefore an unmeaning term, to which no reality corresponds. By this reasoning the terms rain, earthquake, or gravitation would also be unmeaning terms, standing for no identifiable realities. But this would be plainly absurd. Instinct, in other words, is a mere descriptive term, standing for one class of human and animal activities. The problem of the origin or explanation of instinct is a separate problem which cannot, of course, be assumed to be solved by calling an activity instinctive. Unfortunately, Reimarus' own theological explanations of instinct fall far short of the requirements of any explanation satisfactory today, which presupposes the whole apparatus of Darwinian conceptions, through which alone a truly genetic theory of instinct became possible. With this important phase of the topic we shall deal in a subsequent chapter.

IV

An entire chapter of the *Triebe der Tiere* (VII) is devoted to the enumeration and classification of the instincts. Reimarus distinguishes ten different groups, on the basis of the wants subserved or the type of movement employed. Each group is again subdivided, so

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that there results a total of forty-seven different instincts, including the following: (1) To move the body as a whole, or special organs of the body; (2) to find its proper environment, in case the creature is born out of the environment proper for it, or to venture into a different environment, as when aquatic creatures go on land, or land animals seek the water; to work changes in its environment, with a resulting change in life habits; to seek a different climate, as in birds, mammals, insects, and fishes; to take measures against weather changes; to hibernate; (3) to seek for and to discriminate between different substances suitable for food; so Linnæus ascertained that oxen eat 276 different vegetables, rejecting 218; goats eat 449, leaving 126; sheep find 387 acceptable, passing by 141; horses like 262 and reject 212; swine are more particular, eating 72 and leaving 171; and so on; there are further nutritive impulses, such as to handle and prepare food; to hunt and fish; to collect food for the winter; (4) to avoid dangerous objects and deep places; to cleanse themselves; to clear away ordure and other filth, and decaying and dead bodies; to use medicaments and treat injuries; to clothe and otherwise cover themselves; to seek, build, or dig shelter; to shed the skin or change covering in other ways; (5) to recognize and avoid its natural enemies; to use its natural weapons and attack its enemies; to coöperate for defence; (6) to recognize its mates; to make and to interpret vocal calls in mating; to take up the proper position and to bring the genital organs into contact for mating; to render mutual services and acts of kindness to mates; (7) in the care and

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nutrition of the young, to lay, protect, and hatch eggs; to defend the young; to suckle or otherwise feed, to wean and to train the young; (8) on the part of the young, to suckle the mother; to respond to her call and to follow her; (9) to associate with their kind, and to unite in coöperative efforts; to speak and understand a common language; and finally (10) to modify or re-direct the impulses under extraordinary circumstances, and under the influence of human compulsion and training.

Although the instincts operate within the limits of sense perception, they are something more than sensuous conations, a vague, undetermined effort to reach an end, since they include, as already indicated, the employment of highly elaborate means to attain the ends sought. These means are the most adequate and perfect conceivable, so that, in spite of the fact that the animal often possesses a very meagre equipment either in bodily organs or in mentality, and that it has little or no opportunity for acquiring experiences, is often left without parental assistance or example, no species of animals has ever perished, nor are its ranks sufficiently decimated so that the proper numerical proportion among different creatures is ever markedly disturbed.

No animal has wrong, perverted, or superfluous instincts, nor can it have, if the order of nature is to be maintained, and the animals are to survive. This is easily seen if we imagine the instincts interchanged, so that, for example, young chicks would seek the water, like ducks, or if they would attack other animals, like birds of prey, instead of fleeing from them; if the eggs

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of social animals were scattered about, instead of being laid in piles; if the eagle built its nest on the ground, and the lark upon a mountain cliff; if the sheep should attempt to leap chasms, like the chamois or the ibex; if defenceless animals, like deer, would attack animals more powerful than themselves, instead of fleeing before them, etc.

All the individuals of a given species perform their instinctive activities in a uniform or invariable manner, not only in the movements of the body as a whole, but in the movements of the limbs in the performance of special motions and dexterities. The migration of birds, the technique of nest building, the pursuit and killing of prey, the collecting of food for the winter, the spinning of webs, the activities of metamorphosis and pupation in insects, the building of nests and shelter, the feeding of the young, etc., all these activities are performed according to a common model, and as they were in the beginning. To have seen one such action is to have seen all.

Certain instincts do not function at birth, but appear only at a certain stage of the creature's development (delayed instincts). But like the flower and seed in the case of the plant, these instincts presuppose a certain germinal predisposition, which comes gradually to maturity.

On account of the physical weakness of the infants of many animals, especially birds and mammals, the young must be artificially cared for by their parents, and the caretaking instincts provide for their survival through the period of immaturity. It is not to be denied

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that this affords an opportunity for some imitation and learning, which has to be taken into account in any complete account of the mental development of animals. Parental care, however, does not continue any longer than necessary. As soon as the young develop sufficient strength and skill to shift for themselves, they are abandoned, and cast upon their own resources.

CONDILLAC, *Œuvres complètes*, Paris, 1798. See V. Cousin, *Cours d'histoire de la philosophie moderne*, ser. 1, tome III; L. Dewaule, *Condillac et la psychologie anglaise contemporaine*; Reimarus, *Abhandlungen von den vornehmsten Wahrheiten der natürlichen Religion*, 1754; *Betrachtungen über die Triebe der Thiere*, 1760. See Kuno Fischer, *Geschichte der neueren Philosophie*, II; Zeller, *Geschichte der deutschen Philosophie*; Scharer, *Der biologisch-psychologische Gottesbeweis bei H. S. Reimarus*.

CHAPTER X

Philosophical Writers of the Nineteenth Century

I

It is perhaps worthy of remark that, while the philosophers have often been interested in the problems of organization and instinct, they have generally dealt with these topics only in their capacity as biologists or psychologists, without attempting to utilize the facts ascertained for their theory of nature as a whole. One needs only to think of Plato, Aristotle and Thomas Aquinas to note the comparatively external connection between their psychological and biological teachings and their philosophical systems. In the case of Descartes, indeed, a notable discrepancy appears between the theory of nature and the theory of man, but Descartes makes no sustained attempt to bridge the gap, and leaves the two opposing systems of ideas standing side by side. Of the writers dealt with so far Reimarus offers us the first mentionable example of a writer who makes it his deliberate aim to construct a system of philosophy (crude as it is), in which the facts of nature and philosophical generalizations come into actual contact, and mutually illustrate and illumine each other. Instinct appears as only one of numerous forms of organization, all of which argue the existence of an all-wise creator, the author of rational order everywhere (anthropomorphic teleology).

In the nineteenth century a different picture presents

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itself, in that a number of important thinkers, particularly in Germany, such as Fichte, Schelling, Hegel, Schopenhauer, and von Hartmann, advance theories of reality in which the phenomena of organization, including animal instinct, do not remain isolated or alien manifestations, but are assimilated to a fundamental principle running throughout the whole of the natural universe. The problem of natural order and evolution, and of the relation of these to intelligence, comes indeed to assume a central position in these systems, as it did in Reimarus. In contrast to Reimarus, however, the principle of order is envisaged in a purely metaphysical form, the older anthropomorphic conceptions of popular religion being definitely abandoned (metaphysical teleology). The present chapter will sketch, with necessary brevity, the characteristic features of German idealism, in so far as they are relevant to the problem of organic adaptation.

It soon becomes evident, when we study the various writers mentioned, that an important bifurcation of tendencies makes itself felt, with Fichte on the one side, and Schelling and Hegel on the other, Fichte representing a distinctly voluntaristic trend, to be later emphasized and more articulately expressed by Schopenhauer and in still more recent times by Bergson (irrationalism), while Hegel represents a more conservative position, not unlike that of Plato and Aristotle, in which natural order is represented as being due to the operation of a more or less conscious (though perhaps impersonal) reason, as the "realization" of ideas (rationalism, intellectualism). The ends achieved by nature are,

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however, not to be regarded as due to preëxisting, conscious, ideas (unconscious teleology). A difficulty in the understanding of instinct, for example, is that purposiveness is often thought to exist only where there is consciousness. "But instinct is purposive activity, i.e., activity in conformity to an idea, without consciousness (*auf bewusste Weise wirkende Zweckthätigkeit*). The animal does not know its ends as ends; but this activity which unconsciously realizes ends is what Aristotle calls *φύσις*."¹ Teleology is the eternal conformity of things to their idea or nature.

Hegel's influence upon subsequent psychological thought was comparatively slight. The development of speculation was destined to be deflected in an irrationalist direction. We shall seek, in what follows, to trace out the main points in this movement.

The beginnings of modern voluntarism really go back to Leibniz, well back in the seventeenth century (1646-1716), who in turn was anticipated by the Englishman, Glisson, the author of *Tractatus de natura substantiæ energetica seu de vita naturæ* (London, 1672), and by the Cambridge Platonist, Ralph Cudworth (1617-1688), author of *The True Intellectual System of the Universe* (London, 1678). In Glisson's system, motion, instinct, and idea do not appear as isolated manifestations, but are found together in all substances, and Cudworth championed final causes (purposiveness) against the materialism of Hobbes, explaining organic growth as due to a formative energy or plastic principle,

¹ Hegel, *Philosophy of Nature*, § 360. Quoted by Janet, *Final Causes*, p. 346.

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which operates causally as well as teleologically. In contrast to Reimarus and the more deistic interpretations later, Cudworth repudiates the notion of direct action on the part of deity, the plastic principle effecting the organization of nature without consciousness or design.

Cudworth's efforts were seconded by his contemporary, Henry More (1614-1687), who, although a follower of Descartes in the main, combated the materialistic and mechanistic features of the Cartesian system, opposing to it an immaterialism not unlike that of Leibniz.

While the ideas of Leibniz were thus not without important anticipations, it was reserved for Leibniz to give them completer expression, and to formulate a system of metaphysics whose central conception was that of an immaterial principle, analogous to will, working with more or less conscious design to reach rational ends. It is this notion which was taken up and given a fruitful application in various directions by a whole school of writers from Fichte to Bergson.

Leibniz opposed the Cartesian two-world theory (extended substance and conscious substance) with the theory of monads, more or less conscious substances, whose fundamental traits were consciousness and activity. Although substance is sometimes defined entirely in terms of action (*la substance est un être capable d'action*), action is in turn defined as a succession of perceptions, as a progress of one perception to another (*l'appétit est la tendance d'une perception à une autre*). To be sure, there exists in every monad also a passive

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side, manifesting itself in so-called matter, for example, as resistance. However, the difference between activity and passivity is merely one of degree, and there are innumerable intergrades between pure activity and pure passivity (doctrine of continuity). Similarly, on the conscious side, perceptions are divided into clear and obscure perceptions, i.e., perceptions of too low an intensity to affect consciousness, with the more or less clear perceptions between. The monad making up the human soul has the capacity for clear perception, while obscure and confused perceptions are found in the animals and plants. Since perception and impulse are but different aspects of the same process, the obscure perceptions are identical with the formative vital forces, obscure cravings, and unconscious impulses. Expressed otherwise, all beings are conscious, but the consciousness has varying degrees of clearness, and, since ideas are forces, they might be viewed also as impulses, arranged in an imperceptibly graduated scale, from the vital forces of the vegetable and the instincts of animals to the rational activities of man.

With the abandonment of dualism the doctrine of interaction between body and mind loses its significance. The different monads do not act directly upon one another, the monad having "no windows, through which anything can enter or pass out." The soul cannot therefore influence the body, nor can the body influence in any way the succession of perceptions. There exists, however, a rational harmony between the ideal and the so-called corporeal aspects of existence, preëstablished

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from eternity (doctrine of preëstablished harmony, "*consentement préétabli*").

It is evident that we have in Leibniz a number of suggestions of first-rate interest for the student of organic teleology: (1) The definition of reality in terms of activity; (2) the notion of the continuity of nature, from the inorganic realms to man, the differences lying merely in different degrees of consciousness and activity: "everything in nature advances by degrees, and nothing by leaps"; (3) the old Cartesian dualism and interactionism gives way to the notion of spontaneous coördinated changes within the organism, and between all parts of reality, so that nature appears throughout as something autonomous, not regulated or controlled by some principle of intelligence, or other formative agent, external to it, and acting upon it from without. With the exception of the geneticist developments, impossible in his day, Leibniz forecast many features of evolutionary psychology which became prevalent in the nineteenth century.

II

Voluntarism received a strong reënforcement through Fichte (1762-1814), but in an idiom so foreign to empirical science that his influence upon the latter was not noteworthy. His central idea was that the primal reality is will, a will which creates its own environment; the world, or as he phrased it, the non-ego, being nothing but a *Gegenstand*, an obstacle or a check to its own activity. The relative rôles of will and idea are set forth (by no means clearly) in a passage distinctly reminis-

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cent of Plato: "I ascribe to myself a real active force—a force which produces being and which is quite different from the mere faculty of ideas. The ideas or plans, usually called ends or purposes, are not to be considered, like the ideas of cognition, as after-pictures of something given; they are rather fore-pictures, or exemplars of something which is to be produced. The real force, however, does not lie in them; it exists on its own account, and receives from them only its determinate direction, knowledge looking on, as it were, as a spectator of its action."²

Important as a forerunner of Schopenhauer is von Schelling (1775-1854), who propounded the system of "Absolute Identity," according to which subject and object, nature and spirit, are identical in the Absolute. In harmony with Schelling's general conception, too, there is no fundamental antithesis between the inorganic and the organic, which form a single whole, animated by an ideal principle called by Schelling the soul of the world. Osborn³ credits Schelling with the conclusion that "all the functions of life are but the diverse modifications of a single force." Schelling brought into great prominence the concept of the unconscious, which, however, appears in Schelling as a phase of cosmic evolution, and is not developed by him in its relation to empirical psychology, in the sense of today.

This is done by Schopenhauer (1788-1860), who may be said to have raised instinct to the dignity of a cosmic principle. Not only does Schopenhauer regard

² Quoted in Drever, *Instinct in Man*, p. 61.

³ H. F. Osborn, *From the Greeks to Darwin*, p. 104.

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something like instinct or blind will as the moving principle of change and evolution, but he gives a fairly full account of the psychology of instinct, without, however, adding appreciably to the statement given by previous writers on the subject. It will be pertinent, first, to indicate Schopenhauer's metaphysical position, and then to make note of such points in his description of instinct, in the narrow sense, as seem worthy of mention.

Very significant for our whole understanding of nature is Schopenhauer's contention that the rational is often the result of non-rational processes. The mind tends ever to confuse its own view of nature's processes with those processes themselves, and thus to project into nature a fictitious rationality. But a rational product is not always the product of reason. "The astounding amazement which is wont to take possession of us when we consider the endless design displayed in the construction of organized beings ultimately rests upon the certainly natural but yet false assumption that that adaptation of the parts to each other, to the whole of the organism and to its aims in the external world, as we comprehend it and judge of it by means of knowledge, thus upon the path of the idea, has also come into being upon the same path. . . . We can only bring about something designed under the guidance of the conception of the end; but we are by no means justified in imputing this limitation of ours to nature, which is itself prior to all intellect, and whose action is entirely different in kind from ours. . . . It accomplishes that which appears so designed and planned without reflection and without conception of an end, because without

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idea, which is of quite secondary origin.”⁴ Nature, in short, continually simulates both the methods and the results of reason, as if reason were a cause. The true cause is Will, an organic, non-rational principle, acting without intelligent choice, and moving forward as a blind, ceaseless striving, and giving rise to a variety of manifestations, both rational and irrational.

It is evident that in Schopenhauer the term will is used in a far broader sense than commonly understood. It includes the forces of inorganic nature, the more or less conscious strivings in the organic world called tropisms and instincts, as well as the conscious desires and impulses of human nature. In the human mind, even, where the blind impulse comes into the clearest consciousness, the manifest portions of the conscious stream constitute only a fraction of the total stream of life, the sum of those forces that carry us forward through the successive phases of our life history. The full nature and workings of the life impulse remain almost completely below the threshold of conscious apprehension.

The resemblance between Schopenhauer's will and the Darwinian notion of the struggle for existence is unmistakable, while the modern psychoanalytic developments, and sundry quasi-ethical conceptions like the will-to-power, the will-to-believe, and kindred phenomena, find in Schopenhauer distinct anticipations. The philosophy of Schopenhauer forms, indeed, a sort of matrix from which a large number of recent conceptions and tendencies originate.

⁴ Schopenhauer, *The World as Will and Idea*, III, pp. 77-78.

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It will serve to clarify still further Schopenhauer's conception of will if we distinguish clearly between it and the human will, with which it might easily be confused. The human will is not an independent source of free actions, as is often supposed. Will, in this sense, is itself a part of the objective order of nature, one of its manifestations, in space and in time. "The individual, the person, is not will as a thing-in-itself, but is a phenomenon of the will," and is, as such, strictly determined. "Everyone believes himself *a priori* to be perfectly free . . . and thinks that at every moment he can commence another manner of life. . . . But *a posteriori*, through experience, he finds that he is not free, but subjected to necessity; that in spite of all his resolutions and reflections he does not change his conduct, and that from the beginning of his life to the end of it, he must carry out the very character which he himself condemns, and as it were play the part he has undertaken to the end."⁵

The relation between will as a universal cause and its manifestations in nature is further clarified by the distinction Schopenhauer draws between cause, stimulus, and motive, all of which are merely modes in which the will expresses itself. In the vulgar understanding of will, only those changes are regarded as manifestations of will which have their ground in a motive, with the consequence that will is attributed only to men and possibly also to animals. But that the will can act without knowledge is well illustrated by the instincts and the mechanical skill of animals, which strive toward an

⁵ *The World as Will and Idea*, I, p. 147.

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end as definitely as if the actions were due to motives, and knowledge guided them. The house built by a man and that built by a snail are both the work of a will, "a will which works in us according to motives, but in the snail still blindly as formative impulse."⁶ Indeed, the main bulk of the bodily functions in ourselves, all the vital processes like digestion, circulation, secretion, growth, and reproduction, are the result, not of knowledge, but of the blind activity of the will acting according to causes, called in this case stimuli.

Schopenhauer's distinction between cause, stimulus, and motive is instructive as illustrating the general differences between the behavior of inorganic substances and living organisms. In mechanical physics, for example, and everywhere in the changes of non-living bodies, mere causes are operative. Cause is defined as "a state of matter, which, while it introduces another state with necessity, yet suffers just as great a change itself as that which it causes; which is expressed in the rule, action and reaction are equal."⁷ Also, the effect varies in proportion to the cause, so that either term is calculable from the other. On the other hand, the stimulus bears no exact quantitative relation to its effect, so that the measurement of the one on the basis of the other is impossible. A stimulus of small intensity may produce no effect whatever, and variations in the intensity of the stimulus do not produce proportional variations in the effect. All the organic and vegetative changes in the

⁶ *Op. cit.*, I, p. 148.

⁷ *Op. cit.*, I, p. 149.

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animal body are due to stimuli, not to causes.⁸ The motive, finally, is causality accompanied by knowledge.⁹ In nature, the cause, stimulus, and motive pass into one another by gradual transitions, and often operate concurrently. Thus the rising of sap in a plant follows upon stimuli, but is assisted by causes (capillary attraction); the movements of the *Hedysarum gyrans* and the *Mimosa pudica* appear to be produced by the coöperation of stimuli and motives, as are also the contraction of the pupils of the eyes, where the effect of mere light stimulus is enhanced by the painfulness of the intense light, etc.

It is important to note that the advent of motives does not alter the necessity of the act, for "motives act with just as much necessity as stimuli or as causes in the narrowest sense of the word, and their operation can only be neutralized by antagonistic motives, as action is neutralized by reaction."¹⁰ Indeed, cause, stimulus, and motive alike never do more than determine the "point of time and space at which the manifestation of every force is to take place, not the inner nature of the force itself which is manifested." This inner nature is will, to which are to be ascribed "both the conscious and the unconscious changes of the body."¹¹

The difference between plants and animals is that the movements of plants follow upon stimuli, while the activities of animals are often due to motives and knowledge. In the instincts of animals we have the link

⁸ *Op. cit.*, I, p. 149.

⁹ *Op. cit.*, I, p. 150.

¹⁰ *Op. cit.*, I, p. 151.

¹¹ *Op. cit.*, I, p. 150.

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“between movement following upon stimuli, and action following upon a known motive.”¹² Still, what appears to us as mere vegetative and blind force is, according to its inner nature, will, and is the same principle “which constitutes the basis of our own phenomenal being, as it expresses itself in our actions, and also in the whole existence of our body itself.”¹³

An entire chapter of *The World as Will and Idea* (Vol. III, Ch. XXVII) is devoted to an analysis of “instinct and mechanical tendency,” in which the distinctions just referred to are utilized for a very suggestive account of animal behavior. “Animal creatures are set in motion in either of two ways: either by motivation or by instinct; thus from without, or from within; by an external necessity or by an internal necessity.”¹⁴ By motivation Schopenhauer evidently means perceptual experience, a cognitive process arising from the environment. But the distinction between the two kinds of action is not a sharp one. The efficiency of the motive implies an inner tendency which Schopenhauer calls character, which the motive only “individualizes for the concrete case.” Likewise, instinct does not act spontaneously, but is evoked by an external stimulus or situation. So for the migratory instinct the stimulus is the season of the year; for the nest-building instinct, the material for a nest; for the caterpillar the suitable leaf, and so on. “The instinct gives the universal, the rule”; that is, determines the general type of the re-

¹² *Op. cit.*, I, p. 150.

¹³ *Op. cit.*, I, p. 152.

¹⁴ *Op. cit.*, III, p. 96.

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sponse; the intellect determines the particular, the application; it "directs the detail of the execution," adapting the activity to the requirement of the special case. The character is a more general and flexible factor than the instinct; consequently it can be set in motion by very different motives, while instinct can be evoked by "a quite specially determined motive," thus giving rise to an action "always exactly of the same kind."¹⁵ Instinct demands only enough intellect "to apprehend the one quite specially determined motive," while character presupposes a certain width of knowledge, and "consequently a more fully developed intellect: therefore it is peculiar to the higher animals, quite preëminently, however, to man."¹⁶ Instinctive action and action through motivation "stand in a certain antagonism," the former being represented in its maximum in insects, the latter in man, the actions of other animals lying between. If we seek to explain the activities of insects by referring them to the brain, we apply a false key. Their actions are like those of the somnambulist, where the sympathetic nervous system has assumed control of the outward actions. "Insects are, accordingly, to a certain extent, natural somnambulists."¹⁷

The knowledge implied in the adaptation of instinctive actions to the special circumstances of the moment by no means includes the ultimate end of the actions, of which the animal is ignorant. It "wills the end without knowing it," just as in the merely organic functions

¹⁵ *Op. cit.*, III, p. 97.

¹⁶ *Op. cit.*, III, p. 98.

¹⁷ *Op. cit.*, III, p. 99.

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nature attains its ends without knowledge. Even the choice of means is not left to knowledge, "only the more detailed disposition of them."¹⁸

Instinct is merely one of many types of the teleological activity of nature, and every comparison serves "to confirm the conviction that the will is the basis of the one as of the others." Both show us "the subordinate rôle of knowledge in the action of the will," which is sometimes more, sometimes less, and sometimes wanting altogether.¹⁹ All the anticipations of nature, both in instinct and organization, "we might bring under the conception of a knowledge *a priori*, if knowledge lay at their foundation at all." But this is not the case. "Their source lies deeper than the sphere of knowledge, in the will as a thing in itself, which as such remains free from the forms of knowledge; therefore with reference to it time has no significance, consequently the future lies as near it as the present."²⁰

III

The connection between will and idea taught by Hegel and denied by Schopenhauer is reasserted in the spirit of Leibniz by Eduard von Hartmann (1842-1906), who contended that both will and idea must be "conceived as coördinate and equally legitimate principles, which are to be thought of as functions of one and the same functioning essence."²¹ Will may be de-

¹⁸ *Op. cit.*, III, p. 101.

¹⁹ *Op. cit.*, III, p. 103.

²⁰ *Op. cit.*, III, p. 104.

²¹ Ueberweg, *History of Philosophy*, II, p. 336.

fined as the effort to pass from a present state of reality to a future state. But this effort remains a mere skeleton or empty form until a content is supplied by the imagination. "No one can merely will, without willing this or that. There is therefore no will without idea or a mental object, as Aristotle has already said: ὁρεκτικὸν δὲ οὐκ ἄνευ φαντασίας."²²

It is important, however, to guard against the very natural interpretation of these words as meaning that the will has the guidance of consciousness. But the intelligence which supplies the contents of the will is an unconscious intelligence. The unconscious plays as important a rôle in von Hartmann as in Schopenhauer. But in Schopenhauer the fundamental metaphysical principle is will, the intelligence being of wholly secondary origin (*ganz sekundären Ursprungs*). In von Hartmann will and idea are placed side by side: will and representation are united in inseparable unity. "The unconscious Will of Nature *eo ipso* presupposes an unconscious Idea as goal, content or object of itself."²³

Like Schopenhauer, von Hartmann made animal instinct a subject of special study, and devoted several sections of his celebrated work²⁴ to its consideration. We shall summarize in what follows the principal points in his discussion.

Instinct is defined as "a purposive action without consciousness of the purpose." It is not to be explained

²² von Hartmann, *The Philosophy of the Unconscious*, Engl. tr., Vol. I, p. 119.

²³ Quoted by Drever, *op. cit.*, p. 65.

²⁴ *The Philosophy of the Unconscious*, Engl. tr., New York, 1884.

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by reference to bodily organization. This is proved, in the first place, by the fact that instincts are different with similar bodily organization. So all spiders, for example, have similar spinnerets, but one spider constructs its web radially, another in an irregular manner. Birds employ the same organs in nest building, but they build their nests in an infinite variety of ways. The same independence of organ and activity can be seen in the songs of birds, in mating, the protection of their young, and in many other instincts.

In the second place, the same instincts appear with different bodily organization. The mole-cricket digs with its anterior extremities, the burying beetle without any such tools. Birds live in water with or without web feet, and the migratory instinct is manifested by land, water, and air animals, irrespective of the equipment with which to make their journey.

It is true that the instinct cannot be acted out without appropriate bodily organs. But the existence of the organs neither furnishes the motive nor determines the particular character of the action, but this is after all what is to be explained. There exists a similar misapprehension regarding the feeling of pleasure which accompanies the exercise of the instinct. This can at most act as an incentive to action, but does not determine the character or pattern of it. In the case of spiders, for example, the bodily organization and the feeling of pleasure would lead merely to the discharge of the spinning glands, not to the spinning of threads and the construction of webs. Neither does the insect or the fish merely discharge its eggs, but provides for

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their care and hatching. But this is precisely the part of the instinct that calls for explanation.

But careful consideration will show that pleasure does not in fact supply the motive to the instinctive act, as is often supposed. For instinctive activities are often carried through to their conclusion "in utter disregard of personal well-being, even at the cost of life itself." So it may be thought that birds tread for the sake of sexual enjoyment, but they no longer tread when the proper number of eggs is laid, although the sexual impulse still exists. And if the eggs are removed, the treading is resumed. A hen of *Ignex torquilla* whose eggs were continually removed kept on laying, each egg being smaller than the preceding, until after laying twenty-nine eggs the bird was found dead in its nest.²⁵

Moreover, every idea of pleasure presupposes that this pleasure has been experienced before, so that in the earlier case the will must have acted before the pleasure was known. The instinctive impulse, as in hunger, must exist before the animal can know the pleasure of its satisfaction.²⁶

Another suggestion is that instinct is due to "a cerebral or mental mechanism implanted by nature, so that the instinctive action could be executed without individual (if also unconscious) mental activity, and without an idea of the purpose of the action, after the manner of a machine."²⁷ This explanation proves inadequate, von Hartmann replies, because the instinct does

²⁵ *Op. cit.*, I, p. 82.

²⁶ *Op. cit.*, I, p. 87.

²⁷ *Op. cit.*, I, pp. 82-83.

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not function continuously, but only upon the presentation of a sense perception acting as a motive. If it be said that it is the connection between the sense perception and the instinctive response that is mechanical, the answer is that one and the same motive gives rise to different responses, the only constant element being the goal of the instinct, as if on a key board, of which the keys represented the motives and the musical sounds the instincts, no constant relation was found to exist between the key struck and the resulting note, the same key giving out different notes, or different keys the same note. To account for the unlimited adaptation of the instinct to special circumstances, an infinitely complicated mechanism would have to be supposed. But this is unnecessary, since the unconscious representation of an end is all that is required.

A bird will sit on its eggs only if the natural temperature is insufficient. In South Africa the sparrow protects its nest against enemies with thorns. The cuckoo lays its eggs only in the nests of birds whose eggs resemble its own, in size, color, and markings, in order that they may not be thrown out, and there is an invariable resemblance, although, according to Brehm's observations, there are upward of fifty species of birds in whose nests cuckoos' eggs were found. The cuckoo's performance is the more extraordinary since it often selects nests in hollows or in places with a narrow entrance, so that the cuckoo cannot see inside, and is obliged to deposit its eggs from the outside with its beak.²⁸ Bees, when prevented from building their

²⁸ *Op. cit.*, I, p. 106.

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combs from above downwards, will build them from below upwards, or horizontally. The cells on the periphery have not the usual hexagonal shape, but are pentagonal, so that they may be more securely fastened by their broader base to the roof or the wall of the hive. Spiders and caterpillars repair their webs, which requires a different technique from that employed in the original construction.

Such variations in instinct according to circumstances show conclusively that "they are not actions performed mechanically, according to fixed rules," but are performed under the guidance of an unconscious idea of the purpose of the actions in question. "The notion of a dead, external, preordained mental mechanism is . . . changed into the immanent mental life of logic; and we have reached the only remaining mode of conceiving real instinct: *Instinct is conscious willing of the means to an unconsciously willed end.*"²⁹ The inevitable conclusion is that "instinct cannot depend upon the organization of the body or of the brain, since it would be much more correct to say that organization arises through a manifestation of instinct."³⁰ The fact is that both instinct and structure spring from one root, since "instinct and organic formative activity contain one and the same principle . . . and shade into one another without any definite boundaries."³¹

It may be thought that the so-called instinctive ac-

²⁹ *Op. cit.*, I, p. 88.

³⁰ *Op. cit.*, I, p. 86. Cf. Schiller's line: "Es ist der Geist der sich den Körper baut." *Wallenstein's Tod*, III, 13.

³¹ *Op. cit.*, I, p. 86.

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tions are the result of conscious premeditation or reflection, but actions so acquired stand in some sort of proportion to the mental capacity of the animals concerned, which, however, is not the case with instinctive performances, which are essentially equal in all grades of animals. Conscious performances, moreover, are improved by teaching and by exercise. But instinctive actions are performed by animals growing up in isolation from their mates, and their success is perfect from the first. "Instinct never delays or hesitates, but instantly operates, if the motive for its operation occurs."³²

Instinct and consciousness may be employed simultaneously, and the transition between these two modes of activity is gradual. While the lower animals doubtless to some extent employ conscious reflection, so "even in the highest and most abstract rational activity of the human consciousness there are certain factors of the highest importance which essentially agree with that of instinct."³³

But rational reflection can utilize only such data as have come into consciousness by sense perception or otherwise, and the necessary data cannot in many instances possibly be known to the animal. So ferrets and buzzards attack non-poisonous snakes by seizing them in any way, but they seize the adder with the greatest care, in order to avoid its bite, although they have had no experience of the dangerous character of its bite. Most animals know their natural enemies without

³² *Op. cit.*, I., p. 91.

³³ *Op. cit.*, I., p. 93.

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experience. Young pigeons become alarmed when a bird of prey approaches; oxen and horses become restless when a lion is near; a young chimpanzee is seized by feelings of terror at the first sight of a snake; a herd of cattle becomes wild when a gadfly approaches it, and the stingless gadfly is more feared than the stinging variety, apparently because the former causes painful festers in the skin of cattle, a fact which the cattle can, however, hardly be presumed to learn from experience, since the deposition of the fly's eggs and the resulting wounds are separated from each other by too long a period of time.

Animals know their proper food, and even the curative properties of certain substances. Squirrels are more active in collecting their food supply before cold weather. Birds migrate even when they have ample supplies of food, and when the temperature is still high, and leave earlier at the approach of an early winter. When a flood is imminent, the beaver builds higher, and field mice withdraw from the threatened locality. Spiders construct numerous webs at the approach of cold weather, while at the approach of a thaw they conceal themselves.

Among the most remarkable examples of "instinct-knowledge" is the knowledge connected with sex. The males of animals know and seek the females of their own species, although in many kinds of animals (hermit crabs, the insect order *Strepsiptera*, etc.), the two sexes are very different in appearance. The bird builds its nest as the eggs mature in the ovary; the pregnant animal seeks seclusion in a sheltered spot; land animals enter

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the water, aquatic animals go on land, sea fish ascend the rivers, in order in each case to lay their eggs where the conditions for their development are most favorable. Insects lay their eggs where the future larva may obtain food, although the food may not yet exist at the time the eggs are deposited, or they provide the food the larva will require, although the food is not such as they themselves live on. Some species of wasps open the cells of their larvæ in order to replenish their food, and ants open the cocoon for their larvæ from which the latter could not release themselves.

The term which, von Hartmann thinks, best suggests the kind of knowledge displayed in instinct is clairvoyance, a presentiment, either feeble and evanescent, or more or less distinct, of the object to be accomplished. Schopenhauer had spoken of insects as natural somnambulists; it would be more correct to call them natural clairvoyants. They are not mere automata, since their marvellous activities are throughout controlled by unconscious knowledge.

We may best sum up von Hartmann's main points in his own words: "Instinct is not the result of conscious reflection, not a consequence of bodily organization, not mere result of a mechanism founded in the organization of the brain . . . but the individual's own activity, springing from his inmost nature and character. The end, to which a definite kind of instinctive action is subservient, is not conceived once for all by a mind standing outside the individual like a providence, and the necessity to act conformably thereto externally thrust upon the individual as something foreign to him; but

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the end of the instinct is in each case unconsciously willed and imagined by the individual, and the choice of means suitable to the special case unconsciously made. Frequently the knowledge of the purpose of the unconscious cognition is not at all ascertainable by sense-perception."³⁴

SCHOPENHAUER, Complete works, ed. Frauenstädt, 1873-1874; ed. Grisebach, 1892 ff.; ed. Steiner, 1894; ed. Deussen, 1911 ff. English translations: *The World as Will and Idea*, by Haldane and Kemp; *Fourfold Root and Will in Nature*, by Hillebrand. For works on Schopenhauer see monographs by Wallace, K. Fischer, Whittaker, Zimmern; R. Lehmann, *Schopenhauer, Ein Beitrag zur Psychologie der Metaphysik*; Ribot, *La Philosophie de Schopenhauer*; Caldwell, *Schopenhauer's System*; H. Bamberger, *Das Tier in der Philosophie Schopenhauer*; Von Hartmann, *Die Philosophie des Unbewussten*, including *Das Unbewusste vom Standpunkte der Physiologie und Descendenztheorie*, translated into English by Coupland; *Moderne Psychologie*. See A. Drews, *Hartmanns philosophisches System*; Braun, *E. v. Hartmann*; O. Plumacher, *Der Kampf ums Unbewusste*; Volkelt, *Das Unbewusste und der Pessimismus*; S. Butler, *Unconscious Memory*; Kober, *Das philosophische System E. v. Hartmanns*; G. S. Hall, *Founders of Modern Psychology*, pp. 179-243.

³⁴ *Op. cit.*, I, p. 113.

Evolution Theories

Instinct as Inherited Habit. Lamarck and the Lamarckians

I

IT will be useful at this point to summarize briefly some of the more important results reached by the middle of the nineteenth century. Roughly outlined, they stand as follows:

The various activities of man and the animals divide into two large classes or types: (a) Native activities and (b) learned activities. The genesis of the latter can be traced mainly (a) to random experiments, the gradual elimination of unsuccessful acts, and the establishment of those that prove serviceable (trial and error method); and (b) to the observation of the activities in question on the part of other animals (imitation, social tradition). The native activities, on the other hand, are known by the fact that the animal can perform them without any previous observation of them, and without previous experience or preliminary practice. Such activities, performed perfectly for the first time, we call instincts.

The problems arising in connection with instinct are mainly two. The first is to describe the response itself, and to make a list of the various types of native response, on the basis of the structural character of the

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activities, and of the ends subserved by them. This is the problem with which the great naturalists have been mainly concerned. The second problem consists in making an analysis of the neuro-physiological and mental antecedents and correlates, if any, of the response, with a view to explaining it, i.e., assigning its causes.

As regards the overt response itself, it is seen not to be incoherent and characterless, but to have a definite pattern, and by the instincts in the plural we mean so many patterned responses, or reaction systems. The pattern of the response can be explained as due either (a) to organic structure (the "mechanism") set in motion by nervous energy (the "drive"), as the movements of a machine are explained by reference to the motive force, say steam or electricity, and to the structure of the machine itself. So, when an explosion occurs in a gasoline engine, the disposable energy can discharge itself only through a certain channel, and, as a result of this, certain pistons move up and down, certain levers move back and forth, and certain wheels go round and round, each movement being determined by the physical structure, and the relations to each other of the parts of the machine. In a living being, on the other hand, (b) the pattern of the response may be said to be intelligible only in the light of a complex of psychic factors, factors of desire and knowledge. Without such conscious guidance, the organism would indeed be able to move, but its movements would be analogous to those of a runaway vehicle or a derelict vessel, whose motions, un-

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guided by human volition, would be wholly determined by the structure of its parts, the condition of the road bed, and other purely physical causes.

The analysis of the mental background, which appears to be the determinating influence both in activating and in guiding the movements of the organism, yields the following distinguishable features: (a) A vague restlessness or craving, as in hunger, migration, or sex, due to a condition of unstable nervous equilibrium; (b) an affective state (unpleasant), due to the disequilibrated condition or conative hemming; and (c) a conative impulse, usually evoked by an external stimulus, but often occurring spontaneously, leading to an action which results in the relief of the restlessness by the attainment of the object of the conation, and to temporary satiation.

Under normal conditions, the appetency and the expressive activity leading to its satisfaction form a continuous whole, although the second phase (the act itself) may, owing to unfavorable circumstances, or, in man, owing to the interference on the part of intelligence, be more or less delayed. Too long a delay may, in the case of the more imperative impulses, like hunger, lead to the death of the creature, or it may, in the case of wants less important to the individual, like sex and migration, cause the impulse to atrophy, and eventually to disappear. Thus a Brent goose, reported by W. Thompson, kept in confinement for nineteen years, became uneasy for twelve successive seasons at the beginning of the migratory period, but after that

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period it ceased to show any feeling at the migratory season.¹

In the higher animals and in man, there is also in the non-instinctive activities, and in the instinctive activities not occurring for the first time, a set of anticipatory mental images of the act and of its consequences, whose apparent function it is to hold the activity to a fixed course, and to rectify any deviations from the series of actions leading toward the predestined consummation. The persistent purpose thus unifies the creature's activity, by rejecting aberrant and irrelevant actions, and giving to it a trend which is logical in the same sense in which a series of arguments leading to a conclusion is logical. While, then, the activity has preliminary and consummatory phases (as in, say, courtship or nest-building activities), these are only stages of one continuous biological process.

The preliminary anticipation of acts and their ends just referred to cannot be assumed to take place in connection with the instincts of the lower animals, in any case at their first occurrence, for the reason that the creature has had no previous experience of the act and of its consequences, and is therefore (apart from possibilities like clairvoyant intuition) debarred from any source of relevant knowledge.

The problem, therefore, of the activities called instincts calls for a solution which will be able to dispense

¹ Romanes, *Mental Evolution in Animals*, p. 356. It is assumed in this example that we have to do with a case of ordinary atrophy through disuse. The diminution of the conative impulse in illness or age is of course a commonly observed fact, and in the case cited mere ageing is obviously a pertinent factor.

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with the factor apparently important in the explanation of voluntary human activity, that of knowledge. Instincts are extraordinarily "intelligent," that is, highly adaptive and useful to the creature, and yet knowledge cannot be assumed to play any part in their invention and execution. The answer to this problem, which appeared to the men of a generation or two ago so enigmatical as to leave them in speechless wonder, or else prompted them to take recourse to very external theological explanations, like providential guidance,² or to recondite metaphysical hypotheses, like the world soul, the metaphysical will, or some such controlling principle, is heredity, an answer which had been importantly anticipated, as we have seen, by Reimarus, but which had to await the biological developments of the nineteenth century for its articulate vindication.

The men who deserve the principal credit for supplying this key to the problem of the origin of instinct are Lamarck and Darwin. We shall devote the remainder of our discussion to a brief sketch of their achievements.

II

The two principal suggestions of the origin of instinct offered by the evolution theory are those of use inheritance and natural selection. The first theory is mainly associated with Lamarck, the second with Darwin. We shall take up the two views in their chronological order,

² This type of explanation is still very prevalent in the popular thought of today, and in literature. Cf. Bryant's beautiful poem, "To a Waterfowl."

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beginning with the older of the two celebrated naturalists, Lamarck.

Jean Baptiste Lamarck (1744-1829), a botanist of such distinction as to be sometimes called the French Linnæus, author of *Flore française* (1778), a monumental work of six volumes in its final edition, and a zoölogist regarded by many as one of the most eminent between Aristotle and Darwin, the founder, with Cuvier, of the science of paleontology, author of three important works on zoölogy, *Système des animaux sans vertèbres* (1801), *Philosophie zoölogique* (1809), and *Histoire naturelle des animaux sans vertèbres* (1815-1822), is mainly known today as the originator of the doctrine of use-inheritance, and deserves the credit of being the founder of the theory of organic evolution, as this term is understood today.

He opposed Cuvier's doctrine of the sudden creation and extinction of species, maintaining the evolution of plants and animals from primitive germs, by a process of gradual modification. For this he postulated vast periods of time, too great for the imagination to comprehend.

The origin of life itself Lamarck accounted for by a singular hypothesis which would perhaps hardly be worthy of mention did it not bear a resemblance to his ideas about the effect of the factor of appetency or want upon the evolution of organs, as stated in his second law of evolution, to be discussed presently. Life originated by spontaneous generation, due to some physical agent like heat or electricity raising the original gelatinous substance to a state of tension, called by Lamarck

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erethisme (Gr. ἐρεθισμός, irritation), an erethism or state of excitability, a concept which, like that of *besoin*, want or need, in the second law, appears to be psychical in character.

Living things, once existing, undergo constant modifications, the principal determinants of which Lamarck conceived as follows: Alterations in environmental conditions, such as temperature and food supply, due to natural changes, migration, geographical isolation, and the like. These environmental changes produce new needs (*besoin*), leading to new life habits and functions. Such functions modify existing organs, or create new ones, as when land birds are forced by circumstances to obtain their food from the water, and consequently develop structures suitable for wading or swimming. The failure to employ existing organs, on the other hand, causes them to atrophy, as in the cases of moles and certain cave animals, which lose their eyesight through disuse, of the kangaroo, whose forelegs are dwarfed for a similar reason, or snakes, which lose their legs owing to their habit of gliding through the grass and underbrush. Finally, structures and functions which thus appear in response to the needs of the creature are transmitted by heredity, thus providing for the preservation and accumulation of effects through successive generations.

On account of the fact that inheritance in bi-sexual reproduction is dual, traits present in both parents, as they are likely to be especially under conditions of geographical isolation, tend to be reënforced and enhanced in the progeny, while, on the other hand, free

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intercrossing tends to abolish peculiarities through mutual cancellation (law of leveling).

The notion of the struggle for existence, usually associated with the name of Darwin, was familiar to Lamarck, and he frequently referred to it. In the competition for space and the means of subsistence, the stronger and better equipped exterminate the weaker and more defenceless. Thus an automatic limit is set to multiplication, and a certain numerical proportion is maintained between the species, each exerting itself to the utmost to escape destruction by natural forces, through shortage of food, and consequent attacks by competitors.

In the final formulation of his system in the *Histoire naturelle* (1815), Lamarck summarized his doctrine in the now famous four laws of evolution, which on account of their brevity and the controversy which has raged over them, are best quoted in their original form. They read as follows:

(1) "La vie, par ses propres forces, tend continuellement à accroître le volume de tout corps qui la possède, et à étendre les dimensions de ses parties, jusqu'à un terme qu'elle amène elle-même." Life, by the forces immanent in it, continually tends to increase the size of the organism and of its parts, up to a limit automatically set for it.

(2) "La production d'un nouvel organe dans un corps animal résulte d'un nouveau besoin survenu qui continue de se faire sentir, et d'un nouveau mouvement que ce besoin fait naître et entretient." The production of a new organ results from the supervention of a new

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want, which continues to make itself felt, and of a new movement to which this want gives rise and maintains. (Cope's archæsthetism, perhaps better called psychodynamism.)

(3) "Le développement des organes et leur force d'action sont constamment en raison de l'emploi de ces organes." The development of organs and their strength stand in direct relation to the employment of the organs. (Law of kinetogenesis, or of the effects of use and disuse.)³

(4) "Tout ce qui a été acquis, tracé ou changé dans l'organisation des individus, pendant le cours de leur vie, est conservé par la génération et transmis aux nouveaux individus qui proviennent de ceux qui ont éprouvé ces changements." Everything which has been acquired, impressed upon, or changed in the organization of individuals, during the course of their life, is preserved in the process of reproduction, and transmitted to the new individuals which have descended from those having undergone these changes.

The first of Lamarck's laws may be allowed to stand, as it is in any case somewhat vague and unilluminating. The contention of the third law may also be conceded, as it is generally admitted that use and disuse, acting in conjunction with environmental agencies, are the main determinants of modifications of structure during the individual's lifetime. The significance of the factor of need (*besoin*) in the second law, I have discussed in a

³ Compare the impressive array of evidence for Lamarck's principle in Darwin's *Descent of Man*.

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companion volume soon to be issued,⁴ and I shall therefore omit any extended discussion of the subject here. It will be sufficient for the present to draw attention to the concept of need or want as involving a psychic element (the need is asserted to be a felt need), so that evolution is not due, according to Lamarck's doctrine, to purely physical forces, but implies some more or less conscious factor as its precondition, as well as more or less mental orientation in the satisfaction of the animal's needs.

We pass, then, to a brief discussion of the fourth law, which asserts the transmission of traits acquired during the lifetime of the individual, a doctrine which has been the subject of very active controversy, especially since the days of Weismann, the contention being that such acquired traits are not heritable, and are therefore ineffective in the accumulation of differences sufficient to originate new species. I shall in the remainder of this chapter offer such evidence for Lamarck's position as is available today, leaving the arguments against the doctrine for the next chapter, which will deal with the main rival of Lamarck's view, the theory of natural selection, represented by Darwin, and particularly by Weismann and the so-called neo-Darwinians. That the controversy is of first-class importance for the problem of the origin of instincts will be evident without elucidation.

⁴ *Instinct and Intelligence*. Cf. index under "need."

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III

Lamarck's theory of the inheritance of acquired traits applies to both structures and functions, and, as has been seen, the functions may precede and give rise to the structures, like butting to horns (*c'est la fonction qui crée l'organe*). We shall confine ourselves here to the question of the heritability of functions, and particularly of that class of functions called instincts.

The theory of the origin of instinct implied in Lamarck's position has come to be widely known as the lapsed intelligence theory, a term apparently invented by George Henry Lewes, an unlucky venture, since it created what is in my view essentially a man of straw, at which biologists have hurled many unnecessary stones. It may be noted in passing that the theory is by no means original with Lamarck, and still less with Lewes, since it was clearly set forth by Leroy in the following passage, "What we regard as entirely mechanical in animals may be ancient habit perpetuated from generation to generation."⁵

I shall in what follows adduce three lines of argument for the Lamarckian position, two of them positive, arguments from function vestiges, and from certain recent experiments on function inheritance, and one negative, in the form of an answer to the common, and to my mind wholly *mal à propos* objection that instincts could not have been derived from intelligent activities, since this would commit one to the strange assumption

⁵ *Lettres philosophiques sur l'intelligence et la perfectibilité des animaux*, Paris, new ed., 1802.

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that the lower forms of life were characterized by a high degree of intelligence, which tends to disappear as we go higher in the scale. The only available proof of this extraordinary assumption, if we may go by the implied suggestions of the anti-Lamarckians, is the belated existence of certain self-styled higher animals calling themselves Lamarckians! Meanwhile, the Lamarckians are free to retort that the somewhat ill-tempered attitude of some of their opponents is clear evidence of their descent from a savage ancestry, in accordance with the Lamarckian formula.

One of the most striking class of phenomena apparently explained by Lamarck's theory is a long list of what we may call vestigial functions, activities which appear to be vestiges of formerly useful and more fully active functions, which have, however, become atrophied through disuse, but continue to survive in the organism, much as the buttons on the back of a man's coat are today merely useless reminders of bygone modes.

Among the most interesting examples of such functions are the fear reactions, which are often quite irrational, in the sense that they bear no intelligible relation to the actual danger of the objects that evoke them. The avoidance reaction made to so harmless a thing as a crumb of bread in the finger of one's glove, or to a wig one accidentally touches in the dark, is as violent as that made to a red-hot object, a fact which cannot possibly be explained by the recognized significance to the organism of these objects, but only by supposing a very ancient hereditary nervous mechanism which

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fatally brings the wholly useless reaction about. Similar are the reactions to slimy things, creeping things, animals running toward one (we make little difference between lions and mice), which may be thought of as due to organic memories of insects, reptiles, and other primitive enemies of man.⁶ Other fear stimuli, often similarly unjustified, are strange objects, strange animals, and strange men, high places, darkness, deep forests, low sounds, growls, hisses, any unusual sounds,⁷ open places (note the behavior of, say, insects or the domestic cat), closed places, caverns, solitude (think of young children), corpses, ghosts,⁸ the supernatural,⁹ the fear of being lost, and the like. In all these cases we have to do with redundant, partly obsolete functions and functions which, since they demonstrably do not depend on experience, must be ascribed to heredity.

The bodily concomitants of attention offer a further instructive example of an hereditary attitude. The act of attention is accompanied by two distinguishable sets of bodily activities: (1) An attitude of general bodily alertness or tension, and (2) the more special movements of training the sense organs upon the object of

⁶ One of the most abject legacies of the writer's early childhood is the memory of being hotly pursued by a noisy and determined gander. It will be conceded that even to an adult the respect inspired by this awesome creature stands in no relation to the harm he is able to inflict.

⁷ James cites the case of a young gorilla that disliked strange sounds, especially thunder, rain on the roof, and drawn out noises, which threw him into violent agitation.

⁸ Paulsen says somewhere that scientists do not believe in ghosts, especially not in the daytime.

⁹ A dog reported by W. K. Brooks was frightened into an epileptic fit by seeing a bone which was drawn across the floor by an invisible string.

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attention. The latter have the obvious utility of adjusting the sense organs for the most favorable reception of the stimulus. The general muscular tension has no such utility, and can be explained only as a survival of a primitive attitude of alertness in the presence of anything of significance for the welfare of the organism, and hence requiring attention. The custom of rising in the presence of a stranger, today a merely conventional mark of respect, is probably the attentive attitude carried one step further, a relic of a movement preparatory to defence in the presence of a potential enemy. The act of bowing can be similarly imagined to be possibly a relic of a more primitive act of dodging a blow dealt by the "guest"; sneering as a survival of the act of baring the teeth, as still seen in dogs, scowling as a weakened form of grimacing or weeping, hand-shaking as a fragment of grappling activities, or possibly of the sex-embrace, and so forth.

The pugnacious and destructive tendencies in man offer a prolific field for similar observations. Children delight in frightening and being frightened, and the cruelty of young boys is often too gross and harrowing for description. I therefore draw the curtain on this unedifying picture, letting the reader supply examples from his own observations of the incredible cruelty of man to his fellow creatures. That this cruelty and destruction are often wanton is of course the more instructive for genetic psychology. Thus Schneider writes: "The boy does not now eat sparrows, beetles, flies, and other insects that he eagerly seizes and perhaps tears to pieces, nor does he intend to devour the young birds that

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he takes from their nests in high trees, often at the peril of his life; but merely seeing these things wakes in him a strong impulse to plunder, hunt, and kill, apparently because his savage ancestors commonly gained their subsistence by such means. There is in him an intimate causal relation between the sight of certain free animals, or birds' eggs, and the impulse to plunder, slay, and rend. That this was the case with our animal ancestors we are convinced from the life of modern apes, which is sustained principally by means of spoil taken from smaller animals, especially insects, young birds, and birds' eggs."¹⁰

The predilection of adults for hunting and fishing, the deep-seated zest for fighting, actual or vicarious, the pleasure derived from athletic contests, like baseball, which involves only three activities, all of them primitive, hurling a missile, wielding a club, and running for safety, or like football, which is still more rudimentary and primitive, involving pursuit and man-to-man encounter, the exciting effect of the sight or the smell of blood, or of other red objects (the red rag arouses the ferocity of the bull, and the red flag is the symbol of revolt), the fascination exercised by dangerous weapons and armed men,¹¹ the unlimited capacity of man for

¹⁰ G. H. Schneider, *Der menschliche Wille*, p. 62. Quoted by Groos, *The Play of Animals*, pp. 49-50.

¹¹ The whip, the quirt, and even the walking stick in the hand confer upon most people an unmixed pleasure. Or "consider the enormous annual sale of revolvers to persons, not one in a thousand of whom has any serious intention of using them, but of whom each one has his carnivorous self-consciousness agreeably tickled by the notion, as he clutches the handle of his weapon, that he will be rather a dangerous customer to meet. See the ignoble crew that escorts every great pugilist—

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atrocities in war and in peace (compare lynching and the unnamable horrors of like kind committed by "normal" people, even in the absence of maddening war passions), and the avidity of people for accounts of atrocities, real or imaginary, the comparative reconciliation of religious people for the appalling fate of the "damned," the inordinate lust of man-made gods for propitiation and sacrifices,¹² these and similar phenomena make an impressive showing as evidence of the Lamarckian theory of heredity.

The suggestion of Lamarck becomes the more plausible when we consider the comparatively recent date since man has emerged from savagery. Robinson, in his interesting book, *Mind in the Making*, has presented the case in a very striking manner. Imagine the entire period of the evolution of the human race, a period of at least five hundred thousand years, reduced in scale to fifty years, an individual's lifetime, so that a year in his life would correspond to a period of ten thousand years in the progress of the race.

"On this scale it would require forty-nine years to reach a point of intelligence which would enable our

parasites who feel as if the glory of his brutality rubbed off on them, and whose darling hope, from day to day, is to arrange some set-to of which they may share the rapture without enduring the pains! The first blows at a prize fight are apt to make a refined spectator sick; but his blood is soon up for one party, and it will then seem as if the other fellow could not be banged and pounded and mangled enough—the refined spectator would like to reinforce the blows himself." William James, *Principles of Psychology*, II, 413.

¹² Mr. H. G. Wells somewhere (I think in his *Anticipations*), has a description of the Hebrew God, which I give the reader for what it may be worth: "a vigorous but uncertain old gentleman with a beard and an inordinate lust for praise and propitiation."

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self-taught generation to give up their ancient and inveterate habits of wandering hunters and settle down here and there to till the ground, harvest their crops, domesticate animals, and weave their rough garments. Six months later, or half through the fiftieth year, some of them, in a particularly favorable situation, would have invented writing and thus establish a new and wonderful means of spreading and perpetuating civilization. Three months later another group would have carried literature, art, and philosophy to a high standard of refinement and set standards for the succeeding weeks. For two months our generation would have been living under the blessings of Christianity; the printing press would be but a fortnight old and they would not have had the steam engine for quite a week. For two or three days they would have been hastening about the globe in steamships and railroad trains, and only yesterday they would have come upon the magical possibilities of electricity. Within the last few hours they would have learned to sail in the air and beneath the waters, and have forthwith applied their newest discoveries to the prosecution of a magnificent war on the scale befitting their high ideals and new resources. This is not so strange, for only a week ago they were burning and burying alive those who differed from the ruling party in regard to salvation, eviscerating in public those who had new ideas of government, and hanging old women who were accused of traffic with the devil. All of them had been no better than vagrant savages a year before."¹³

¹³ *The Mind in the Making*, pp. 83-84.

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IV

It remains to answer the common objection urged against the Lamarckian position that the instinctive equipment of man could not have been derived from earlier intelligent activities (the "lapsed intelligence" theory), and to cite some experimental proof of Lamarck's doctrine of use-inheritance.

The unfortunate term "lapsed intelligence" has been the source of much misunderstanding of the Lamarckian position, and has prejudiced the theory to an extraordinary degree. You need only to state your opponent's position in an extreme and untenable form to find its refutation an easy task, and of this method of dealing with Lamarck's theory the literature of biology is full. I cite only two examples of well known American biologists, but this number can be indefinitely multiplied.

The following is from Holmes' well known work, *The Evolution of Intelligence*: "Efforts to explain the origin of instinct by gradual evolution were made from time to time before Darwin applied his theory of natural selection to the solution of the problem. The most noteworthy theory was Lamarck's doctrine that instinct is inherited habit. It is well known that actions frequently performed come in course of time to be performed automatically and unconsciously, as is illustrated by the familiar example of learning to play the piano. Granting that the modifications produced by habit are inherited, it is evident that the repetition of an action generation after generation would produce a

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congenital proclivity to its performance which might in time develop into a true instinct. Since habits are frequently the result of intelligent experience, instinct was conceived by some writers as due to the gradual automatizing of such experience by frequent repetition; in the words of G. H. Lewes, instinct is 'lapsed intelligence,' a view which makes intelligence first in order of appearance and instinct a secondary result of a sort of psychic degeneration." Holmes proceeds to quote Whitman's refutation of the lapsed intelligence theory, which makes the strange assumption, according to Holmes, that "the lowest animals are free from instinct and possessed of pure intelligence," and that in the higher forms intelligence lapses into instinct. But, Holmes thinks, just the reverse is the case. "Among the lower forms behavior is all but exclusively of the reflex type. Passing up the animal series we find intelligence gradually growing upon instinctive foundations," etc.¹⁴

Guyer similarly falls back on the authority of Whitman in his rejection of the Lamarckian position, quoting at length the same passage from Whitman's work, *Animal Behavior*, from which Holmes' excerpts were taken.¹⁵

A careful reading of the passages in these writers will reveal the fact that no genuine effort is made to discover the elements of truth which may be contained in the Lamarckian view, but that we have to do with an off-hand rejection of the theory of the great naturalist,

¹⁴ S. J. Holmes, *op. cit.*, pp. 115-116.

¹⁵ M. F. Guyer, *Being Well Born*, pp. 144-145. Cf. also C. O. Whitman, *Animal Behavior*, Woods Hole Biological Lectures, 1898.

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which is prejudiced throughout by the use of Lewes' exaggerated phrase. It is of course not necessary that we make the bizarre assumption that we "find the lowest animals free from instinct and possessed of pure intelligence." All that is necessary to suppose is that activities acquired by any imaginable method (perhaps with a minimum of consciousness, or even in a wholly accidental manner—reason or intelligence are in any event out of the question) become in time more and more automatized through repetition, and eventually become so deeply impressed as to exert some hereditary influence. The gradual establishment as habits of even accidentally formed activities is a matter of daily observation, and the degeneration of the "impulse," the complex of conscious processes present in the earlier performances of the act, is familiar to every psychologist, and is described in every psychology text-book. I have already indicated in other connections the manner in which an act may be acquired for the first time. I shall therefore merely summarize briefly at this point the principal methods of such initial acquirement, so as to make clear that the assumption of "pure intelligence" at that stage is wholly gratuitous and unwarranted.

Acts may originate (1) in a wholly accidental manner, the most successful of a number of random movements gradually emerging after a number of trials (trial and error method). (2) Often acts are acquired or assisted by imitation, and (3) they may be preceded by some consciousness, the higher animals apparently performing the act after some mental experimentation.

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This mental activity may proceed merely by the trial and error method, different possibilities being imaginatively anticipated, or else there may be an actual analysis of the situation into its factors, and a mental grasp of relations, enabling the animal to solve a problem without the wasteful hit-or-miss efforts of the trial-error procedure (reason, originality).

It is important to note that in all cases the successful act, if repeated, becomes gradually reduced to the level of habit, that is to say, it becomes more and more automatic, the conscious processes originally accompanying them becoming reduced without limit, until they reach a vanishing point, so that habits approximate in time the status of the organic activities, like respiration, the principal difference being that the overt actions called habits are evoked by external stimuli, while the organic activities, like respiration or the heart beat, are actuated by intra-organic stimuli.

Whether functions acquired in the manner just sketched are actually inherited, as claimed by Lamarck, is a question upon which opinion is divided, and for the solution of which experimental evidence is unfortunately somewhat scant. The neo-Darwinians, as is known, deny the heritability of such acquired functions, explaining instincts in a different manner. I cite, in conclusion, some experiments reported by two eminent biologists, the Swiss Pictet, and the Frenchman Marchal, which clearly point to the inheritance of acquired functions. Other instances are reported here and there, and a number of investigations are now in progress, the

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results of which are not yet fully available. The following cases have to do with inherited modifications of the nutritive instinct.

Pictet fed to caterpillars of different species food other than that on which they normally subsist. In the case of several night-flying moths the taste for the new diet was transmitted by heredity, individuals whose parents had come to tolerate the unaccustomed diet eating it with much greater readiness. The caterpillars of the gypsy moth, which live normally on the leaves of oaks and birches, were fed on walnut leaves, which they ate under protest. The moths which issued from this rearing were less highly colored and smaller; but the fourth generation had become accustomed to the diet, and had resumed the size of the insects living on a normal diet.

Marchal's experiment consisted in forcing the scale insect of the peach (*Lacanium corni*) to live on honeylocust, and certain of the larvæ adapted themselves to this food. The following year the insects reproduced upon the locust, and their young had become so thoroughly adapted to their new host that it proved impossible to rear to sexual maturity those which had been transplanted again to their original host, the peach.

A well known example of the apparent heredity of acquired habit is the mulberry silk worm, cited by Darwin, which has, in its evolution from a wild to a domesticated state, gradually adapted itself to conditions which would earlier have been fatal to it.¹⁶

¹⁶ All quoted in Bouvier, *The Psychic Life of Insects*, Engl. tr., 1922, Ch. VIII.

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Darwin himself, as is well known, recognized the Lamarckian principle, although he regarded it as of subordinate importance in producing evolution, placing the emphasis upon natural selection operating upon congenital variations. Both types of explanation are clearly expressed in the third chapter of *The Descent of Man*: "Some intelligent actions, after being performed during several generations, become converted into instincts and are inherited, as when birds on oceanic islands learn to avoid man. These actions may then be said to be degraded in character, for they are no longer performed through reason or from experience. But the greater number of the more complex instincts appear to have been gained in a wholly different manner, through the natural selections of variations of simpler instinctive actions."¹⁷

Lamarck's general position has been widely accepted by biologists and students of genetic psychology, although the drift of opinion has gone strongly against Lamarck in the last decade or two. Prominent among Lamarckians are Spencer, Lewes, Sully, Cunningham, and Henslow in Great Britain, Hyatt and Cope in the United States, Preyer, Haeckel, Schneider, Eimer, Wilser, Hertwig, and Wundt in Germany, Ribot and Foveau de Courmelles in France, and Canastrini and Cattaneo in Italy.

IN addition to Lamarck's own works, cited in the text, see Hutton, *Darwinism and Lamarckism*; Packard, *Lamarck*; Cope, *The Primary Factors of Organic Evolution*; Butler, *Evolution Old and New*;

¹⁷ Darwin, *The Descent of Man*, new ed., New York, 1892, p. 67.

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Pauly, *Darwinismus und Lamarckismus*; Landrieu, *Lamarck et ses précurseurs*; Haeckel, *Die Naturanschauung von Darwin, Goethe, und Lamarck*; A. de Quatrefages, *Darwin et ses précurseurs*; Perrier, *La Philosophie Zoologique avant Darwin*.

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Natural Selection. Darwin and Neo-Darwinism

I

THE twin concepts of erethism and conscious need, which appear in Lamarck as activating and regulatory forces in living beings, as well as his notion of a general biological advance as the result of the hereditary preservation of individual improvement, lend to the Lamarckian theory of evolution an idealistic aspect with which the more materialistic version of evolution appearing under the leadership of Darwin in the second half of the nineteenth century stands in fairly sharp contrast.

In Charles Darwin (1809-1882), the greatest British naturalist of the nineteenth century, and one of the most eminent scientific men of all time, the problem of regulation and teleology is central. But whereas thinkers generally (outside the strictly naturalistic systems of antiquity, and their materialistic counterparts in modern times) had sought to explain teleology, Darwin in reality explains it away. The order of nature, so "rational" in its adaptation of part to part, appears as merely the end-product of an essentially irrational process: its explanation is not to be sought in some comprehensive design of a benevolent deity, as taught by theology, nor in an immanent principle of rationality, as envisaged by philosophic idealism, nor yet in

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some vague, half-conscious urge, as in Schopenhauer or Lamarck, but in purely physical causes. The evolution of the natural order is the result of the action of "natural" forces. The watchwords of Darwinism are variability, competition, elimination of the unfit, and hereditary transmission of the traits of the favored few (few, because the wastage is prodigious—nature is "red of tooth and claw"). The destructive forces of nature operate blindly; the "selection" of the preferred forms is somewhat analogous to the sifting out of certain individuals by some automatic device, some vast sieve or sorting machine, the remainder being abandoned to destruction by natural forces.

True as this representation is as compared with the unrealities of the older design arguments, and to such monuments of artificiality as the historic theodicies of the religio-philosophical systems, there are significant omissions and inadequacies in the Darwinian account, especially of the evolution of organisms. But it is the evolution of organisms with which Darwin is mainly concerned.

We shall return in the sequel to these critical considerations, after an exposition of the Darwinian point of view. This will fortunately not require to be very circumstantial, since a number of the classical positions of evolutionism, gradual as opposed to catastrophic modifications, struggle for existence, selective mating, in which the strongest males compete successfully for the possession of the most favored females, the accumulation of effects through heredity, and similar conceptions, were fairly familiar ideas when Darwin began

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his work, and were developed with special success, as we have seen, by his great predecessor, Lamarck.

Indeed, with the exception of the important feature to which allusion has just been made, Darwin stands much closer to Lamarck than to many of the neo-Darwinians. He accepts the fundamental Lamarckian principle of the heritability of acquired characters, including functional adaptations, like instincts, supplementing this, however, by a principle which he regarded as more crucial, that of natural selection. Modifications of individuals, and hence the evolution of new species, are not due solely to the transmission of the results of individual experience, and of function or use, but also (and especially) to the inheritance of congenital characteristics. This belief was clearly expressed in many passages in *The Origin of Species*, *The Descent of Man*, and elsewhere. Thus, in *The Origin of Species*, he says: "It would be the most serious error to suppose that the greater number of instincts have been acquired by habit in one generation, and then transmitted by inheritance to succeeding generations. It can be clearly shown that the most wonderful instincts with which we are acquainted, namely, those of the hive bee and of many ants, could not possibly have been acquired by habit." And elsewhere he says: "Although, as I have attempted to show, there is a striking and close parallelism between habits and instincts; and although habitual actions and states of mind do become hereditary, and may then, as far as I can see, most properly be called instinctive; yet it would be, I believe, the greatest error to look at the great majority of instincts as acquired

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through habit and become hereditary. I believe that most instincts are the accumulated result, through natural selection, of slight and profitable modifications of other instincts; which modifications I look at as due to the same causes which produce variations in corporeal structure."¹

Darwin's view of the dual origin of instinct was adopted by G. J. Romanes (1848-1894), who did much to disseminate and establish it by his distinction between primary and secondary instincts, the former being those "which arise by way of natural selection, without the intervention of intelligence," the latter those "which are formed by the lapsing of intelligence."² In this view he was followed by men like Foveau de Courmelles, in France, by Lloyd Morgan, in his earlier period, in Great Britain, and many others.

Darwin's description of instinct includes the main points usually made nowadays: its independence of experience, its uniformity within a given species, the absence of prevision or conscious purpose. Nevertheless, instinct is not wholly rigid and automatic; "a little dose of judgment or reason . . . often comes into play, even with animals low in the scale of nature."

A comparison of instinct with habit will show a number of similarities. (1) Both are unconscious performances. (2) They are often constant throughout life. (3) They are composed of smaller, more specific acts, which are linked together to form larger, continuous activities, like foraging or nest building (instincts), or

¹ MSS., quoted in Romanes, *Mental Evolution in Animals*, p. 264.

² Romanes, *op. cit.*

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playing a musical instrument (habit). (4) Such serial activities, whether instincts or habits, can only be performed in the sequence originally established, i.e., they are non-reversible. (5) Habits, like instincts, are "associated with other habits, with certain periods of time, and states of the body."³

Indeed, except for the difference in their origin, habit and instinct are indistinguishable. If Mozart had been able to play the piano at the age of three without any practice, instead of playing with very little practice, the act would have been instinctive. The difference between the two activities is not structural, but genetic. Habits are individual acquirements, instincts racial acquirements. The former are acquired traits, the latter native traits. The theory of the origin of instinct through natural selection constitutes Darwin's special contribution to comparative psychology.

The cardinal points in the Darwinian exposition are spontaneous variation, the survival of the fittest, and the transmission of their traits to their progeny.

(1) Instincts vary in all directions, some of the variations being more useful than others. So the migratory instinct varies "both in extent and direction, and in its total loss." Nest building shows variations even in the same species. Bees will use a substitute for wax in the building of their hives if wax is not readily available,

³ Darwin might have added that both are usually evoked by an external stimulus, acting in conjunction with the physiological state, as in nutrition and sex, where the instinctive activities manifest themselves under conditions of physiological readiness (craving), and external stimulation (presence of food and mates); or piano playing, which occurs only at the sight of the score, and the feeling of the keys.

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and instead of pollen they will use a different substance, like oatmeal. The fear instincts vary widely, and the significance of this for the creature is evident without explanation.

(2) Individuals born with the more advantageous traits are preserved by natural selection, while those showing disadvantageous traits tend to perish.

(3) The surviving individuals (the "fittest") reproduce themselves, and transmit their traits to their progeny. These in turn vary indefinitely from each other, and a new struggle ensues, with the same result as before: the elimination of the less fortunately equipped, and the selection of the more suitable forms, and so on, generation after generation. In this way there is effected a "slow and gradual accumulation of slight, yet profitable variations," resulting in time in the production of the remarkable adaptations we see.

That the important changes brought about in the course of time have been actually reached by passing through transitional stages can be proved by actually producing the intermediate stages in collateral lines of descent. "I have been surprised to find . . . how very generally gradations, leading to the most complex instincts, can be discovered. Changes of instinct may sometimes be facilitated by the same species having different instincts at different periods of life, or at different seasons of the year, or when placed under different circumstances, in which case either the one or the other instinct might be preserved by natural selection."⁴

Darwin noted what seemed to him two important

⁴ *The Origin of Species*, Ch. VIII, p. 322.

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objections to the Lamarckian theory that instincts are racial habits, the cases where an instinct is performed only once in a lifetime, and the hereditary phenomena among neuter insects, facts which pointed to the strong probability that some other factor besides the Lamarckian is implicated.

In the first place, some of the most complicated architectural instincts, like the construction of shelter for offspring, occur only once in the lifetime of the creature, the individual in question often not surviving to observe the results of its activity, so that there is no possibility of improvement through experience, to be handed down by heredity. Darwin overlooks the possibility of improvement in an activity during its performance, a phenomenon often observed in the acquisition of a habit. That the neural modifications which must occur in the process of such improvement are to some extent heritable is abstractly possible.

Secondly, there is the remarkable case of the instincts of sterile insects, which has furnished problems for all theories of heredity. In the honey bee, for example, the activity of the queen is almost wholly confined to the laying of eggs, while the drone's sole function is to impregnate the queen. Neither one takes any part in the general activities of the hive, the gathering of honey, making the comb, and caring for the young, functions which are performed exclusively by the workers, or sterile females. But "habits confined to the workers or sterile females," Darwin observes, "however long they might be followed, could not possibly affect

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the males and fertile females, which alone have descendants.”⁵

Darwin's theory of natural selection was strongly supported by the labors of August Weismann (1834-1914), whose investigations in the embryology especially of insects and crustaceans proved of the utmost importance in determining modern views of heredity. His doctrine of the “continuity of the germ plasm,” already suggested before him by Gustav Jäger, seriously damaged the Lamarckian theory of use inheritance through the apparent discovery of the physical isolation of the germinal materials of heredity (the contents of the germ cells), and its consequent inaccessibility to the influences emanating from the body as a whole, thus providing for great stability of the hereditary equipment through successive generations. Since the germinal material is the exclusive medium of heredity, there can be no transmission of the results of individual experience, which are lost with death, only the racial traits remaining effective for phylogenetic development.

The natural selection theory of the origin of instincts has, largely owing to Weismann's influence, been adopted by a very large number of writers, among them Galton, Virchow, Meynert, His, Flügel, Wallace, Ray Lankaster, Dyer, Lloyd Morgan, Brooks, Van Bemmel, Spengel, Ziegler, Groos, James, Forel, Ziehen, Baldwin, and others.

⁵ Mr. O. E. Plath informs me that in the case of the hive bee, as well as other social hymenoptera, males are frequently produced by workers. If this is true, Darwin's objection falls to the ground.

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An apparently significant contribution to the problem under controversy is the theory of so-called organic selection put forward by a number of recent writers, which suggests that acquired modifications, although not directly inherited, may influence the direction of evolution through prolonging the life of the individual, and thus giving congenital variations additional selective value. The latter are shielded, so to say, by the existence of the useful acquired traits, thus giving the latter an indirect developmental influence. "In the evolution of instinct," as Holmes says, "the factor of organic selection would appear to be especially potent. The practical outcome of its operation is much the same as if the effects of experience were actually inherited, and we are thus able to explain, in terms of selection, phenomena which at first sight appear to furnish strong evidence for the transmission of acquired characters."⁶ In the case of conscious adaptation a direction is thus given to evolution which it would not take apart from the interference of intelligence, and in this way organic evolution, as Baldwin points out, is subject to a partial conscious regulation and control, "for of all the variations tending in the direction of an adaptation . . . only those will be supplemented and kept alive which the intelligence ratifies and uses."

II

Baldwin's statement suggests a general criticism of the Darwinian theory, to which brief allusion has al-

⁶ *The Evolution of Intelligence*, p. 137.

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ready been made, and with which we may suitably close. The criticism may be stated in two parts, but both relate fundamentally to the same point, the exclusion of the concepts of activity and consciousness from the Darwinian system. Perhaps the first point will be most advantageously treated by contrasting the Darwinian version of evolution with that of Bergson, in which the emphasis is distinctly shifted to factors which obtain only scant recognition in the Darwinian theory.

One of the difficult points in the interpretation of Bergson's system is to ascertain the precise status of matter in the universe. In spite of the universal animism which Bergson often seems to teach, we find him bringing mind and matter into sharp opposition, as if they were after all two discrepant and non-equatable principles. Evolution seems to be largely the outcome of an incessant struggle (an eternal *Wechselspiel von Hemmen und von Streben*) between these two fundamental forces. Life is thus the active principle, as in Aristotle or Stoicism, matter a sort of weight or foil, with which life has to contend. The life force may be compared with the energy of a rocket, which raises it through the air, while matter may be likened to the rocket itself, whose inertia has constantly to be overcome, and which falls to the earth when the force inside it has spent itself. Life is somewhere summarily described as a tendency to act on matter. Intelligence and instinct are said to be, at an early stage of evolution, prisoners of matter, which they are not yet able to control.

Whether the notion of matter as a substance wholly

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disparate from life is really intelligible or not, it serves a useful purpose here, since it tends to bring into clear relief an idea of capital importance for any theory of evolution which is to be at all adequate. This is the Bergsonian notion of vital impulse, the *élan vital*, a sort of tension or inner urge, which is the real driving force of evolution, and without which there would be no evolution at all.

The reigning scientific theory of evolution presents a somewhat different picture. Two points are worthy of notice. One is that the factors said to bring about evolution, natural selection and heredity, are so-called natural factors, that is, they are blind and mechanical in their operation. In the second place, their activity is not creative or productive, but merely negative and critical. They destroy ill-adapted forms, and at most permit those adapted to environmental conditions to exist. Their function, if we may say so, is not productive, but only permissive.

But it does not require unusual reflection to see that a purely critical and destructive agent cannot account for the continued origination of things, although it may account for their survival after they have once come into existence. In order for the forces of nature to be able to eliminate forms, there must be forms to eliminate—there must be a tendency on the part of nature to produce organisms and variations before the environment can begin its critical and destructive industry. But the very thing which natural science presupposes or treats as negligible may be of first importance for any final theory of nature, and Bergson, at least, among

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recent writers, has raised what seemed to many an unimportant point into a central principle. The most fundamental tendency of nature is not the tendency to cut off and destroy, but to form and create.

The living spring or thrust, the will to struggle, without which nature would be like a reed robbed of its resiliency, is perhaps best illustrated by the individual organism, whose survival, as we well know, depends not merely on its environment, but upon itself. Its chances for survival are good in case it shows conative energy, as it is plucky and "quick on its feet."

Friedrich Paulsen has stated the case forcibly: "The presupposition of all development, without which the above-mentioned principles (natural selection, etc.) would have no support for their activity, is, of course, the will to live, the will to struggle for existence, common to all things taking part in evolution. They do not suffer the development passively; they are not, like the pebbles in the brook, pushed into a new position by mechanical causes acting from without. Their own activity is the absolute condition for the efficacy of natural selection. The struggle for existence is not imposed upon individuals from without; it is their own will to fight the battle; and without this will . . . there would be no struggle for existence at all."⁷

The second point of criticism relates to the rôle of intelligence in the struggle for existence, a factor dif-

⁷ Compare the following from Weber's work on the *History of European Philosophy*: "Now, we may ask ourselves the question, Does not the Darwinian principle, which materialism invokes with such confidence, corroborate, rather than overturn, the hypothesis of immanent teleology? Is it really true that the struggle for existence is a first

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ferent from mere conative impulse or craving, which would seem to be the prerequisite to the employment of any of the creature's capacities.

Darwin's main concern is ostensibly with the natural history of living beings, and it seems almost too obvious for mention that conscious orientation must be a factor of large importance in the individual's struggle for survival. Thus sensory acuity, memory, cunning, the power to forecast the future, pluck and persistence of will must be items relevant to the creature's success as well as its merely physical equipment, like horns, teeth and talons, protective covering, fleetness, sexual fertility, and the like. The struggle for existence, to say all in a word, is not made by a thing (a thing can hardly be said to struggle at all, in any legitimate sense), but by a psychophysical organism, whose wants and capacity for mental orientation determine in large part the direction of its evolution, and not merely the forces and vicissitudes to which it is subjected.

The discussion of instinct since the days of Darwin and Weismann has ramified considerably, and has reverted largely to description and to the analysis of the neurological and psychological background of animal activities. The most notable phenomena are the revival of mechanistic and tropistic explanations of behavior, and the large attention paid to the study of the overt activities of animals under the leadership of the "be-

cause and exclusively mechanical? Does not the struggle for life, in turn, presuppose Schopenhauer's will to live, will or effort, without which, according to the profound remark of Leibniz, there can be no substance? . . . What can the formula, struggle for existence, mean, except struggle *in order to exist*?" English translation, p. 572.

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havior" psychologists. Since the main questions at issue remain controversial, their treatment hardly belongs to the history of psychology, and will be reserved for a supplementary volume.

THE important works of Darwin are *The Origin of Species* (1859), *The Descent of Man* (1871), and *The Expression of the Emotions in Man and Animals* (1872). See also the essay on Instinct in the Appendix of Romanes, *Mental Evolution in Animals*. On Darwin consult, Wallace, *Darwinism*; Romanes, *Darwin and After Darwin*; Poulton, *Darwin and the Theory of Natural Selection*; F. Darwin, *The Foundations of the Origin of Species*; *Fifty Years of Darwinism*, by various American writers; *Darwinism and Modern Science*, by various foreign writers; Thomson, *Darwinism and Human Life*; Pauly, *Darwinismus und Lamarckismus*; Holmes, *Evolution of Animal Intelligence*, and literature cited there.

On Weismann, see especially Weismann, *The Germ Plasm*; "The All-Sufficiency of Natural Selection," *Contemporary Review*, February, March, and May, 1893; *Vorträge über Descendenztheorie*; Engl. trans., *The Evolution Theory*. See also Romanes, *A Critical Examination of Weismannism*; Hertwig, *The Biological Problem of Today*; Cope, *Primary Factors of Organic Evolution*; Poulton, *Essays on Evolution*. On important precursors of modern evolution ideas see F. von Bärenbach, *Herder als Vorgänger Darwins und der modernen Naturphilosophie*; Schultze, F., *Kant und Darwin*; and the works by Haeckel, de Quatrefages, and Perrier, cited under Lamarck.

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